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ABSTRACT

This document, which is based on data gathered during the 1992 National Adult Literacy Survey (NALS), examines the literacy skills of the U.S. civilian labor force, including the employed and unemployed. The following topics are among those discussed: (1) human resources and the U.S. economy; (2) literacy proficiencies of the nation's labor force; (3) literacy proficiencies of key demographic, socioeconomic, and regional subgroups of the labor force (men and women; various age, racial, and ethnic groups; adults with different levels of schooling, poverty status, and areas of residence; native versus foreign-born adults); (4) literacy proficiencies of the labor force by industry and occupations (including front-line blue-collar workers and health care workers); (5) literacy proficiencies and earnings; (6) literacy proficiencies and adults' educational attainments, school enrollment behavior, and literacy training experiences; (7) employability and earnings potential of the nation's unutilized and underutilized working-age population; (8) estimated effects of prose, document, and quantitative literacy proficiencies on labor market activities, earnings and incomes (as demonstrated by a multivariate analysis); and (9) participation in basic skills training programs. A total of 150 tables/figures are included. Appendices contain guidelines for interpreting the literacy scales, an overview of procedures used in the NALS, and a list of participants in the development process. (MN)

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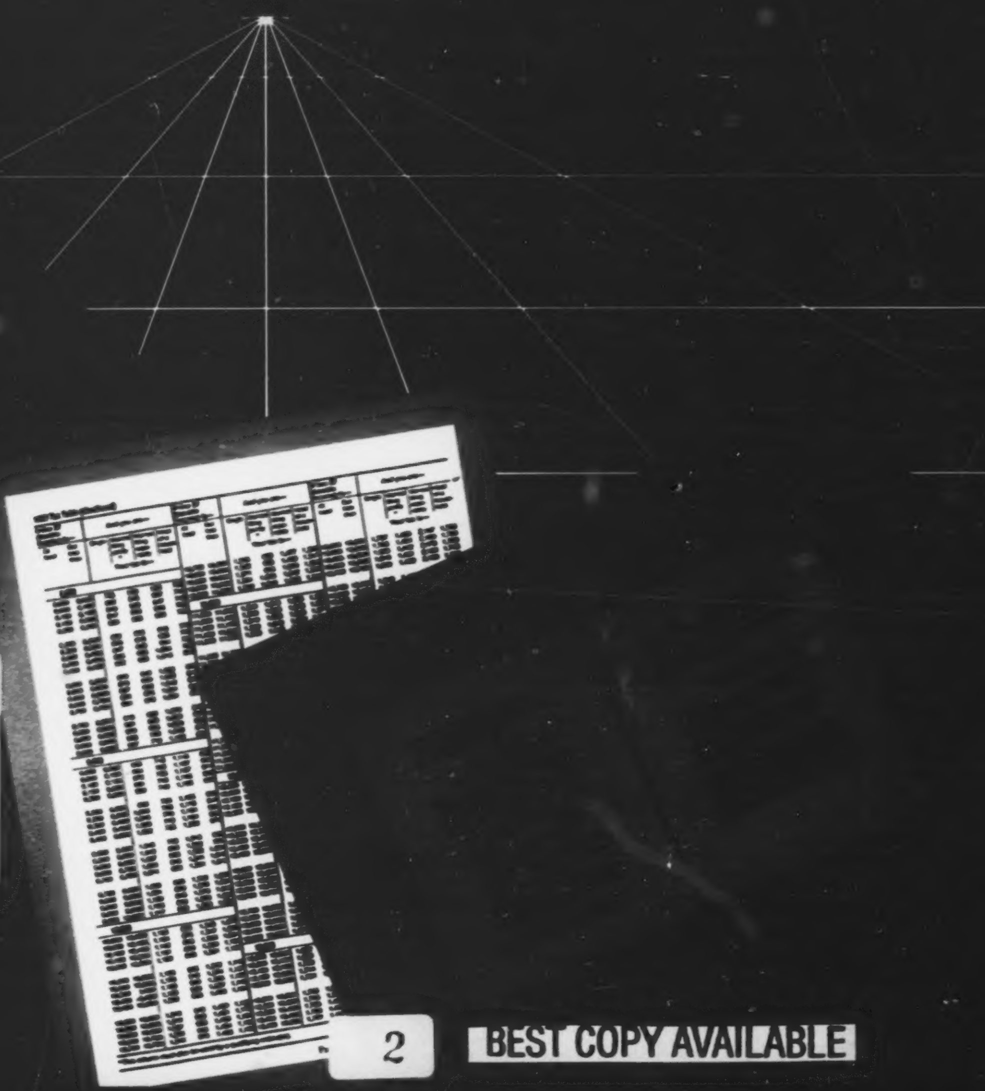

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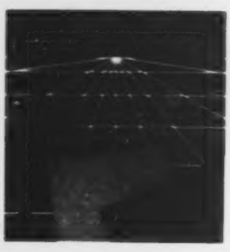

EXECUTIVE SUMMARY

This is one in a series of reports that examines the results of the National Adult Literacy Survey, a project funded by the U.S. Department of Education and administered by Educational Testing Service, in collaboration with Westat, Inc. This report primarily focuses on the literacy skills of the nation's civilian labor force, including the employed and unemployed.

Many past studies of adult literacy have tried to count the number of "illiterates" in this nation, thereby treating literacy as a condition that individuals either do or do not have. We believe that such efforts are inherently arbitrary and misleading. They are also damaging in that they fail to acknowledge both the complexity of the literacy problem and the range of solutions needed to address it.

The National Adult Literacy Survey is based on a different concept of literacy and, therefore, takes a different approach to measuring it. The aim of this survey is to document the English literacy of adults in the United States based on their performance across a wide array of tasks that reflect the types of materials and demands they encounter in their daily lives.

To gather the information on adults' literacy skills, trained staff interviewed nearly 13,600 individuals aged 16 and older during the first eight months of 1992. These participants had been randomly selected to represent the adult population in the country as a whole. In addition, about another 1,000 adults were surveyed in each of 12 states that chose to participate in a special study designed to provide state-level results that are comparable to the national data. Finally, some 1,100 inmates from 80 federal and state prisons were interviewed to gather information on the proficiencies of the prison population. Prisoners are not a part of the nation's labor force, however, and their results were excluded from this report.[1]

Each survey participant was asked to spend approximately an hour responding to a series of diverse literacy tasks as well as questions about his or her demographic characteristics, educational background, labor force status, job characteristics, reading practices, and other areas related to literacy. Based on their responses to the survey tasks, adults received proficiency scores along three scales which reflect varying degrees of skill in prose, document, and

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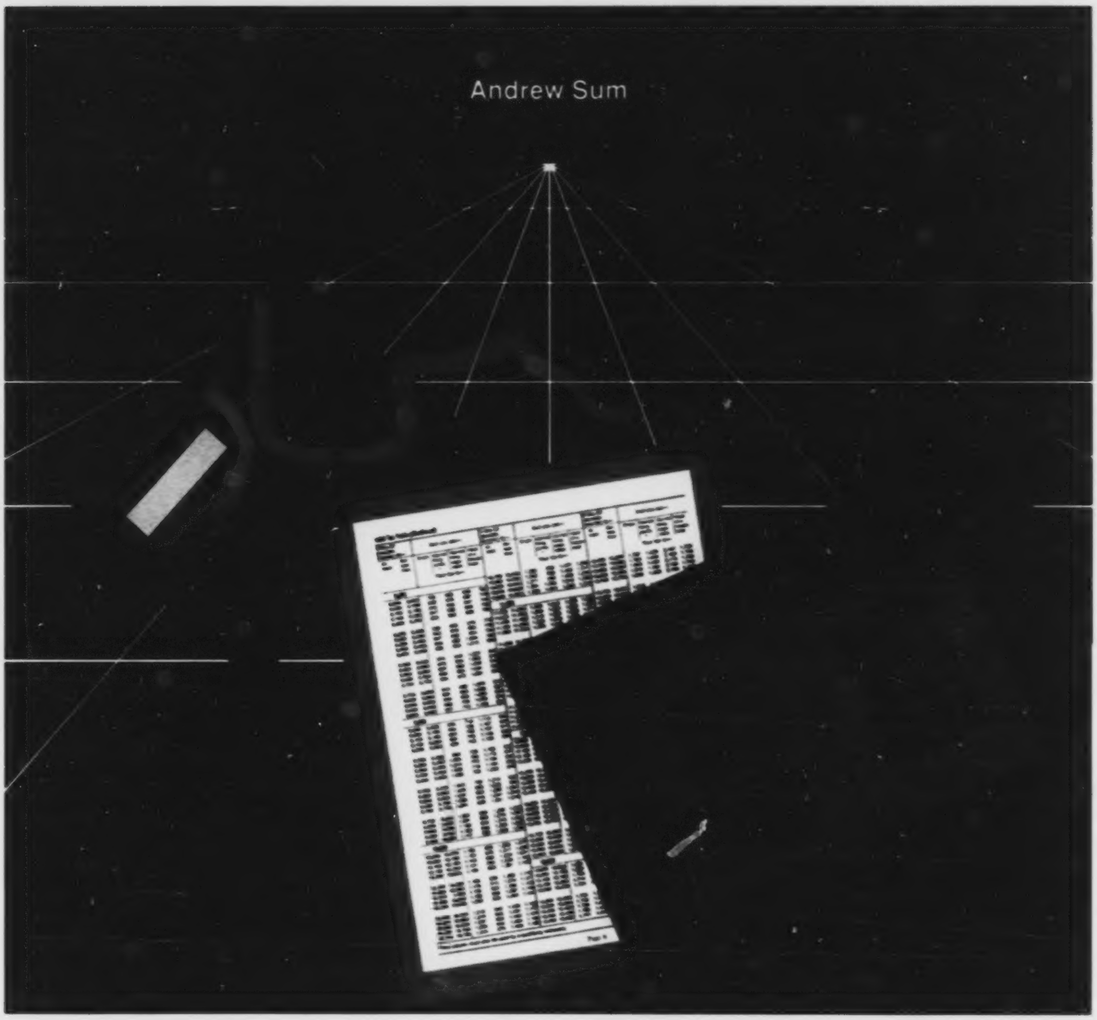

Andrew Sum

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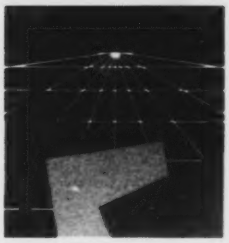

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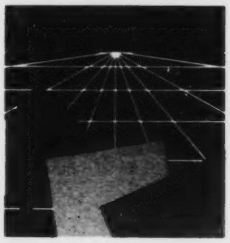

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The National Adult Literacy Survey was a cooperative effort planned by the National Center for Education Statistics and the Division of Adult Education and Literacy of the U.S. Department of Education. At Educational Testing Service, Irwin Kirsch directed the National Adult Literacy Survey and played a key role in the development of this report.

The research work appearing in this report was guided by a NALS Committee on Business and Labor whose members were: Paul Barton of Educational Testing Service, Nancy Cobb, Manager of the Human Resources Development Department at the Nabisco Biscuit Company, Anthony Sarmiento, Director of the Education Department of the AFL-CIO, and Andrew Sum of Northeastern University's Center for Labor Market Studies, the author of this report. The committee's work received the constant guidance and encouragement of Irwin Kirsch of ETS and Andrew Kolstad of the National Center for Education Statistics.

The bulk of the statistical analyses underlying the findings in this report were conducted by Kate Pashley of ETS. Her dedication to completing the numerous statistical analyses requested by the Committee on Business and Labor is greatly appreciated. Norma Norris and Don Rock of ETS were helpful in providing technical guidance. Thanks are also due to Mary Michaels for managing administrative details.

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Lynn Jenkins edited the manuscript in a thorough and meticulous manner and guided it through the final stages to publication. The design for the NALS reports was created by Robin Matlack of ETS's Publications Division.

Finally, I wish to thank the thousands of adults across the country who gave their time to respond to the survey. Without their participation, this study would not have been possible.

Andrew M. Sum
Director
Center for Labor Market Studies
Northeastern University

FOREWORD

The 1992 National Adult Literacy Survey provided a statistical portrait of the literacy skills of U.S. adults 16 years old and older. The wealth of information flowing from this survey gave new information resources to the community of adult educators and scholars of literacy that had previously had few statistical resources to bring to the policy arena.

The population of adults 16 years old and older changes very slowly over time, as immigrants arrive, emigrants leave, young people are born and reach the age of 16, and people die. Because most adults in this age group have finished their formal schooling, changes in aggregate literacy skills are probably marginal. Because it is safe to assume that the literacy skills of this population change slowly over time, NCES plans subsequent literacy assessments at one-decade intervals. The next national assessment of adult literacy is expected in 2002, with data reporting scheduled for 2003. Because changes in skills occur so slowly, it is also true that analyses of the 1992 data remain relevant today.

A number of different secondary analysts have used the 1992 survey to illuminate aspects of adult literacy. This study of the literacy skills of the adult labor force was commissioned by NCES as one in a series of reports designed to provide a more detailed look at particular aspects of adult literacy. While prepared in consultation with NCES staff and other experts, in the end this report presents the views of the author, not NCES or the U.S. Department of Education. NCES commissioned this report to promote the exchange of ideas among researchers and policymakers.

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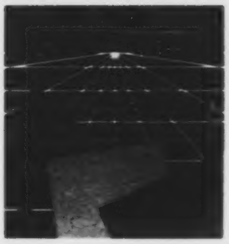


PREFACE

Perhaps never before have so many people from so many different sectors of our society been concerned about adult literacy. Numerous reports published in the last decade have indicated that a large portion of the United States population lacks adequate literacy skills, and many employers say they cannot find enough workers with the reading, writing, mathematical, and other competencies required in the workplace. Changing economic, demographic, and labor market forces may exacerbate the problem in the future.

Whether the gap between our nation's existing literacy resources and its literacy needs will widen remains an open question; the evidence to prove or discredit such predictions is scarce. Many believe, however, that we must respond to the literacy challenge if we are to preserve our nation's economic vitality and ensure that every individual has a full range of opportunities for personal fulfillment and participation in the economy and society.

This view was reaffirmed at the historic education summit in Charlottesville, Virginia, where the nation's governors — including then-Governor Clinton — met with then-President Bush to establish a set of national education goals for the twenty-first century. As adopted in 1990 by members of the National Governors' Association, one of the six goals states:

> *By the year 2000, every adult American will be literate and will possess the knowledge and skills necessary to compete in a global economy and exercise the rights and responsibilities of citizenship.*

But how should this ambitious goal be pursued? In the past, whenever the population's skills were questioned, critics tended to focus on the educational system and insist that school reforms were needed if the nation were to escape serious social and economic consequences. Yet, many who need to improve their literacy skills have already left school. In fact, it is estimated that almost 80 percent of the work force for the year 2000 is already employed. Clearly, then, the schools alone cannot address our nation's literacy needs. A broader response is necessary.

To initiate such a response, we need more than localized reports or anecdotes from employers, public leaders, or the press. Accurate and detailed information is essential. Surprisingly, though, we lack answers to even the most basic questions, including how many individuals have limited literacy skills, who are they, and how severe are their problems.

In 1988, Congress asked the U.S. Department of Education to address this need by reporting on the nature and extent of adult literacy in this nation. In response, the Department's National Center for Education Statistics and Division of Adult Education and Literacy called for a national household survey of adult literacy. A contract was awarded to Educational Testing Service and a subcontract to Westat, Inc. to design and conduct the National Adult Literacy Survey. To give states an opportunity to explore the literacy skills of their own populations, all 50 states were invited to participate in the State Adult Literacy Survey, a concurrent study that would provide state-level results.

During the first eight months of 1992, trained staff visited thousands of households across the nation to interview adults age 16 and older. In all, some 26,000 adults were surveyed, representing more than 191 million individuals nationwide. Each respondent was asked to spend about an hour performing diverse literacy tasks and answering questions about his or her personal background, education, work experiences, and reading practices.

The survey results represent the most comprehensive data base ever available on adult literacy in this nation. In an effort to disseminate the results to a wide and diverse audience, the findings are being issued in a series of reports. This report profiles the literacy skills of adults who are actively participating in the work force as well as the proficiencies of working-age individuals who are not in the labor force. Readers who seek additional information may wish to read *Adult Literacy in America: A First Look at the Results of the National Adult Literacy Survey*, or one of the companion reports on literacy and education, literacy among older adults and among prisoners, literacy and language, and literacy practices.

Our hope is that this report will be a valuable resource to those who are concerned about the literacy of the current labor force and those who are addressing the needs revealed in these data.

Irwin S. Kirsch
Project Director

quantitative literacy. The scales are powerful tools which make it possible to explore the proportions of adults in different subpopulations of interest who demonstrated various levels of performance.

This report analyzes the literacy proficiencies of the nation's civilian labor force with respect to certain subpopulations such as the employed and unemployed and demographic and socioeconomic subgroups of employed civilians. The report also compares the literacy proficiencies of workers in major occupations and industries and analyzes the relationship between literacy proficiencies and weekly wages and annual earnings. Some of the major findings are highlighted here.

Literacy Proficiencies in the Labor Force

- Mean literacy proficiencies on all three scales — prose, document, and quantitative — were higher for adults participating in the labor force than for those outside of the labor force.
- Forty to 43 percent of the labor force scored at the two lowest levels of literacy proficiency, while only one out of four labor force participants scored at the two highest levels of proficiency, and only 3 to 5 percent scored at Level 5, the highest proficiency level.
- Younger adults (age 16 to 65) who were not in the labor force had higher literacy proficiencies than older adults (over the age of 65), on average. One-third of those age 16 to 65 who were neither working nor looking for work had proficiencies equal to or greater than the average for all labor force participants.

Literacy Proficiencies of the Employed and Unemployed

- On the document and quantitative scales, full-time employees outperformed part-time employees. Both groups had much higher average literacy proficiencies than the unemployed. In general, unemployment rates among labor force participants who scored in Level 1 were four to seven times higher than those of participants in Level 5.
- The mean scores of full-time employed men and women were similar on each of the three literacy scales, with women faring slightly better than men on the prose scale (7 points) and men performing slightly better than women on the quantitative scale (4 points).

- The oldest age groups of full-time employed civilians (age 55 to 64 and age 65 and older) had the lowest proficiency scores, on average, while those age 35 to 44 had the highest.
- On each literacy scale, mean proficiencies were higher for white full-time employees followed by Asian, Black, and Hispanic full-time employees.
- Foreign-born full-time workers who had lived in the United States for 10 years or less had significantly lower average literacy proficiency scores than native-born full-time workers.
- The mean literacy scores of the full-time employed were positively related to educational attainment. The mean scores of college graduates were higher than those of high school graduates, which were higher than the mean scores of high school dropouts.

Literacy Proficiencies by Industry and Occupation

- The highest mean literacy proficiencies were posted by workers in the finance, insurance, and real estate industries and the public administration sector. Workers in goods-producing industries (agriculture, construction, manufacturing, mining) had the lowest proficiencies, on average.
- Mean literacy proficiencies were highest for professional workers, followed by managers, administrators, and technical workers. Mean scores were lowest for semi-skilled and unskilled blue-collar workers and for farm, forestry, and fishing workers.

Literacy Proficiencies and Earnings

- The literacy proficiencies of the employed were positively and strongly associated with their weekly and annual earnings. On the prose scale, mean weekly earnings ranged from $355 for full-time workers in Level 1 to $531 for those in Level 3 to a high of $910 for those in Level 5.
- The weekly earnings impact of higher literacy scores was smaller for workers who had completed some high school (9 to 12 years, no diploma) and largest for those with a two- or four-year degree.
- The direct earnings effect of higher literacy proficiencies was larger for older workers than for younger workers. For example, comparing the annual earnings of workers in Level 3 with those in Level 1, the relative earnings ratio rises from 1.10 for 16- to 24-year-olds to 1.78 for 45- to 54-year-olds.

Literacy Proficiencies of the Poor or Near Poor and of Public Assistance Recipients

- The literacy proficiencies of the poor or near poor (those living in households with a combined money income below 125 percent of the poverty line) and of AFDC recipients were well below average on each of the scales. However, poor or near poor adults who were in the labor force had higher average proficiencies than those not in the labor force.

Participation in Basic Skills Programs

- Less than 5 percent of those in the labor force had ever participated in any basic skills training outside of their high school. However, labor force participants with lower literacy proficiencies were more likely than those with higher proficiencies to have received basic skills training in the past five years. Even so, only 6 percent of labor force participants in Level 1 had received basic skills training during the past five years.
- Among those who said they had received some basic skills training since leaving school, only four out of ten indicated that the training was provided by an employer or labor union.

Reflections on the Results

These results do not answer the question: "Are the literacy skills of our nation's workers adequate?" They do, however, provide some critical information about the literacy levels of those in and those not in the labor force, as well as the employed and the unemployed. Overall, civilians in the labor force displayed higher literacy skills than those out of the labor force, and employed workers outperformed the unemployed.

Still, more than 40 percent of those in the labor force posted literacy scores within the lowest two levels. Moreover, less than 5 percent of labor force participants had received any recent training in these basic skills. Together these findings paint a bleak outlook for the future of the United States labor market. On the positive side, however, the mean literacy scores of the full-time employed rose from the youngest age group to the 35 to 44 age group, then declined as age increased. These results indicate that newer entrants into the full-time labor force will have stronger average literacy proficiencies than those who will be retiring over the next decade, thereby raising the average proficiency of the labor force.

In addition, the rising annual earnings differentials between college and high-school graduates appear to reflect, in part, a rising economic payoff to literacy proficiencies. Those who earn a college degree possess considerably stronger literacy skills and are more likely to be rewarded for their skills with higher earnings and faster wage growth.

Analyses of literacy proficiencies by occupation and major industry revealed large variability across sectors, partially due to educational requirements of certain occupations and industrial groups. While workers in finance, insurance, and real estate industries and the public administration sector posted relatively high proficiencies, many front-line, blue-collar workers within the good-producing industries displayed quite limited skills. Given that 60 percent performed in Level 1 or 2 on the prose and document scales, further investments in the literacy skills of our front-line workers may help to improve our productivity and future economic competitiveness.

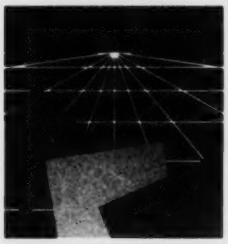
Literacy skills are strongly related to weekly and annual earnings overall and for most demographic and socioeconomic subgroups of the employed, although the relationship is considerably weaker for younger workers (under the age of 25) and for high-school dropouts. The earnings effects of higher prose and quantitative scores are significantly associated with the intensity with which workers use their reading, writing, and mathematics skills on the job. Employees who apply such skills daily at work had sharply higher economic returns than those who do not. Raising the productivity and earnings potential of the future work force will require simultaneous increases in both the demand and supply of literacy proficiencies.

Literacy deficits also seem to be an important barrier to the employability of the poor or near poor who are not active in the labor force. Integrating education programs with job placement, job search training, and job training programs may provide the means for encouraging more disadvantaged citizens to enter the workforce as well as raise the long-term earning potential of future labor force participants.

Finally, there is a need for expanded literacy training of the nation's workers through their workplace. The National Adult Literacy Survey data indicate that nearly all subgroups of employees, including front-line workers, receive positive economic payoffs from higher literacy proficiencies. Future efforts geared towards improving the quantity and quality of on-the-job literacy training are likely to be important in maintaining and improving the country's labor productivity, real wages, and economic competitiveness.

Endnotes

[1] For information about the literacy skills of the prison population, see Karl Haigler, Caroline Harlow, Patricia O'Connor, and Anne Campbell, *Literacy behind prison walls: Profiles of the prison population from the National Adult Literacy Survey*. Washington, DC: U.S. Department of Education, National Center for Education Statistics, 1994.



INTRODUCTION

In recent years, educators, economists, human resource professionals, national commissions, and policymakers have increasingly emphasized the need to strengthen the literacy skills of the current and prospective United States work force. To date, however, there has been little systematic and statistically reliable data to support such recommendations. Rigorous, comprehensive evidence on the range of literacy skills in the adult population in general, and the working population in particular, has been largely absent from policy debates about the need for additional human resource investments. Most available data are based on studies of in-school populations[1] and of young adults.[2] For these populations, literacy skills may have a smaller impact on labor market success than for more experienced workers who have had access to a wider array of jobs and had more time to be sorted among such jobs.

The National Adult Literacy Survey (NALS) was designed to respond to the need for accurate and detailed information on the literacy skills of America's adults. This large-scale assessment, conducted by Educational Testing Service in 1992 for the United States Department of Education, makes it possible to explore the range of literacy proficiencies in the nation's civilian labor force, including individuals who are currently working as well as those who seek to work. It builds on an earlier survey conducted by Educational Testing Service in 1989-90 for the United States Department of Labor, which examined the literacy skills of selected subgroups of job seekers.[3]

Adult Literacy in America: A First Look at the Results of The National Adult Literacy Survey provided a general picture of the literacy proficiencies of the entire adult population (age 16 and older) and of subgroups defined by various demographic and socioeconomic characteristics.[4] This report investigates the literacy skills of America's labor force, assesses the implications of these skills for labor market success, and offers detailed information for policymakers and others who are concerned about the quality of our nation's human resources.

Human Resources and the United States Economy

It is a widely shared belief among labor market analysts that the quality of a nation's human resources largely determines its long-term economic fate. Twenty years ago, Frederick Harbison in *Human Resources as the Wealth of Nations* stressed the preeminence of "the energies, skills, talent, and knowledge of people" in the economic development of nations.[5] Broad-based development of the nation's human resource potential is needed to ensure economic, social, and political progress and prevent wide inequalities in the earnings and income distributions. "The wealth of a nation," Harbison noted, "can be expressed in terms of the level of development and the effectiveness of the utilization of human energies, skills, and knowledge for useful purposes."[6]

More recently, in *Thinking for a Living: Education and the Wealth of Nations*, Ray Marshall and Marc Tucker argue that human resources are primary in determining the nation's future economic growth and competitiveness. "The future now belongs to societies that organize themselves for learning," the authors state. "What we know and can do holds the key to economic progress, just as command of natural resources once did."[7] They attribute the lackluster productivity of the economy in the early 1990s largely to the poor development of the nation's human resources and a failure to use human resources efficiently at the workplace. The authors outline a plan for a "learning society," a comprehensive and integrated system of education and training involving not only the schools, but also families, communities, and workplaces.

Other recent studies and reports have addressed the growing turbulence in the nation's product and labor markets caused by increased international competition, industrial restructuring, economic deregulation, corporate downsizing, and technological change.[8] Most call for a more comprehensive and coordinated set of human resource policies, both public and private, to alleviate emerging problems. Foremost among the recommendations are upgrading the literacy proficiencies of high-school graduates, revamping the school-to-work transition system for the non-college-bound, expanding investments in educating and training front-line workers, improving reemployment assistance for dislocated workers, and strengthening linkages between schools and employers, labor and management, and government and employers.

Many observers believe that the literacy skills of America's adults have increased steadily over time in response to growing demands in the workplace and in society. Still, some are concerned that the United States has, or soon will have, a "literacy deficit" — that is, a mismatch between the supply of and demand for literacy skills in the labor force. In its widely disseminated 1983 report *A Nation at Risk*, for example, the National Commission on Excellence in Education warned of "a rising tide of (educational) mediocrity that threatens our very future as a nation and a people."[9] Growing international economic competition and changing technologies were predicted to increase the demand for highly skilled workers and upgrade skill requirements for many existing occupations, and failure to substantively raise the academic achievements of future students was expected to have dire economic and social consequences. Learning was cited as an "indispensable investment" for achieving national economic growth and competitiveness in the new global economy.

The widely cited *Workforce 2000* study also raised concerns about future skill imbalances in the United States economy.[10] On the supply side, lower growth in the nation's working-age population was projected to reduce the growth rate of the labor force in the 1990s to its lowest level since the 1930s. Further, continued demographic shifts in the work force were expected to occur as women, racial/ethnic minorities, and immigrants accounted for an increasing share of net new labor force entrants. On the demand side, the globalization of the economy, structural changes within and across industries, and technological changes were projected to raise the formal educational requirements and skill demands of future jobs. Employment was predicted to increase fastest in professional, technical, and high-level sales occupations, which require above-average levels of formal schooling and literacy skills. If appropriate public policy and private sector responses were not forthcoming in education and training, it was predicted that these skill imbalances would lead to labor shortages, slower economic growth, increased structural unemployment, and rising economic disparities across racial/ethnic groups.

While generally concurring that human resource investments should be increased, other analysts disagree with these predictions of a serious labor and skills shortage in the United States. Lawrence Mishel and Ruy Teixeira, for example, have argued that, while the formal educational and literacy requirements of projected jobs are rising, they are not outstripping the formal educational attainments or literacy proficiencies of the labor force.[11] At the same time, they have identified a number of work force problems that must be addressed. Key among these is the trend of stagnant or declining real wages for most employee subgroups, especially those with no postsecondary education. The primary human resource challenge, in their view, is to improve training and raise worker productivity, thereby supporting renewed growth in future real wages and incomes.

Similarly, The Commission on the Skills of the American Workforce studied hundreds of firms in all sectors of the economy and interviewed thousands of employers and supervisors and failed to uncover systematic evidence of increasing skills shortages among workers. In its 1990 report

America's Choice: High Skills or Low Wages!. The Commission indicated that technological developments in the workplace are raising skill requirements for some jobs and lowering them for others, with little net change.[12] While some employers are dissatisfied with workers' literacy skills, most do not stress a shortage of literate job applicants or skilled employees. In fact, 80 percent cite their major concern as "finding workers with a good work ethic and appropriate social behavior."

The Commission concluded that, while the education and skills of the United States work force are in rough balance with the requirements of existing jobs, the nation will face a number of important human resource challenges. Raising real wages, for example, will require sustained improvements in worker productivity, which in turn will necessitate simultaneously upgrading workers' skills and increasing the skill requirements of jobs. This entails reorganizing work and shifting to high performance organizations that demand more skills and decision making responsibilities from workers.

In sum, regardless of whether they believe that a skills shortage is impending in the United States work force, many labor market analysts agree that literacy, education, and training determine the labor market success of individuals and the economic prosperity of nations. The problem is that, to date, there has been relatively little comprehensive information about the literacy proficiencies of the adult population in this nation — information that is essential for prudent decision making about human resource investments. The data from the National Adult Literacy Survey provide, for the first time, a detailed statistical portrait of the literacy skills of the nation's entire civilian labor force and of important demographic and socioeconomic subgroups.

The National Adult Literacy Survey

The National Adult Literacy Survey grew out of the Adult Education Amendments of 1988, in which the United States Congress called on the Department of Education to report on the definition of literacy and on the nature and extent of literacy among America's adults. In response, the Department's National Center for Education Statistics (NCES) and the Division of Adult Education and Literacy planned a national household survey of adult literacy.

In September 1989, NCES awarded a four-year contract to Educational Testing Service to design and administer the National Adult Literacy Survey and to analyze and report the results. A subcontract was given to Westat, Inc., for sampling and field operations. Over the next few years, an extensive process was undertaken to develop a working definition of literacy for the study, construct survey instruments that would measure adults' proficiencies and gather important background information, collect and analyze the survey data, and report on the results.

Defining and Measuring Literacy

The plan for developing and conducting the National Adult Literacy Survey, as well as the concurrent State Adult Literacy Surveys, was guided by a panel of experts from business and industry, labor, government, research, and adult education. This Literacy Definition Committee worked with Educational Testing Service staff to prepare a definition of literacy that would guide the development of the assessment objectives as well as the construction and selection of assessment tasks. A second panel, the Technical Review Committee, was formed to help ensure the soundness of the assessment design, the quality of the data collected, the integrity of the analyses conducted, and the appropriateness of the interpretations of the final results. In addition, representatives from the states that participated in the State Adult Literacy Surveys guided the collection, analysis, and interpretation of data from the state surveys.

The definition of literacy that guided the National Adult Literacy Survey and State Adult Literacy Surveys was rooted in two preceding literacy studies funded by the federal government and conducted by Educational Testing Service: a 1985 household survey of the literacy skills of 21- to 25-year-olds, funded by the U.S. Department of Education,[13] and a 1989-90 survey of the literacy proficiencies of selected job seekers, funded by the U.S. Department of Labor.[14] The national panel of experts assembled to construct a definition of literacy for the young adult survey rejected the types of arbitrary standards — such as signing one's name, completing five years of school, or scoring at a particular grade level on a school-based measure of reading achievement — that have long been used to make judgments about adults' literacy skills. Through a consensus process, this panel drafted the following definition of literacy for the young adult survey:

> ***Using printed and written information to function in society, to achieve one's goals, and to develop one's knowledge and potential.***

Unlike traditional definitions of literacy, which focused on decoding and comprehension, this definition encompasses a broad range of skills that adults use in accomplishing the many different types of literacy tasks associated with work, home, and community contexts. This perspective is shaping not only adult literacy assessments, but also policy, as seen in the National Literacy Act of 1991, which defined literacy as "an individual's ability to read, write, and speak in English and compute and solve problems at levels of proficiency necessary to function on the job and in society, to achieve one's goals, and to develop one's knowledge and potential."

The definition of literacy from the young adult survey was adopted by the panel that guided the development of the 1989-90 survey of job seekers, and it also provided the starting point for the discussions of the National Adult Literacy Survey's Literacy Definition Committee. This committee agreed that it is inappropriate to express the literacy proficiencies of adults in school-based terms or grade-level scores. In addition, while the committee viewed teamwork, interpersonal, and communication skills as important in various contexts, such as the workplace, it decided that these areas would not be addressed in this survey.

Further, the committee endorsed the notion that literacy is neither a single skill suited to all types of texts, nor an infinite number of skills, each associated with a given type of text or material. Rather, as suggested by the results of the young adult and job-seeker surveys, an ordered set of skills appears to be called into play to accomplish diverse types of tasks. Given this perspective, the Literacy Definition Committee agreed to adopt not only the definition of literacy but also the three scales developed for the earlier studies:

Prose literacy — the knowledge and skills needed to understand and use information from texts that include editorials, news stories, poems, and fiction; for example, finding a piece of information in a newspaper article, interpreting instructions from a warranty, inferring a theme from a poem, or contrasting views expressed in editorials.

Document literacy — the knowledge and skills required to locate and use information contained in materials that include job applications, payroll forms, transportation schedules, maps, tables, and graphs; for example, locating a particular intersection on a street map, using a schedule to choose the appropriate bus, or entering information on an application form.

Quantitative literacy — the knowledge and skills required to apply arithmetic operations, either alone or sequentially, using numbers embedded in printed materials; for example, balancing a checkbook, figuring out a tip, completing an order form, or determining the amount of interest from a loan advertisement.

The literacy scales, built initially to report on the results of the young adult survey and augmented in the survey of job seekers, provide a useful way to organize a broad array of tasks and to report the assessment results. They represent a substantial improvement over traditional approaches to literacy assessment, which have tended to report on performance in terms of single tasks or to combine the results from diverse tasks into a single, conglomerate score. Such a score fosters the simplistic notion that "literates" and "illiterates" can be neatly distinguished from one another based on a single cutpoint on a single scale. The literacy scales, on the other hand, make it possible to profile the various types and levels of literacy among different subgroups in our society. In so doing, they help us to understand the diverse information-processing skills associated with the broad range of printed and written materials that adults read in many different aspects of their daily lives and their many purposes for reading them.

In adopting the three scales for use in this survey, the committee's aim was not to establish a single national standard for literacy. Rather, it was to provide an interpretive scheme that would enable levels of prose, document, and quantitative performance to be identified and allow descriptions of the knowledge and skills associated with each level to be developed.

The Literacy Definition Committee for the National Adult Literacy Survey recommended that a new set of literacy tasks be developed to enhance the literacy scales for this survey, without compromising the ability to compare the results with those of the young adult and job-seeker surveys. The new tasks, like most of those administered in the earlier studies, were open-ended. They simulated real-life literacy demands, measured a broad range of information-processing skills, and covered a wide variety of contexts. There was a greater emphasis on tasks that required brief written and/or oral responses and that asked respondents to describe how they would set up and solve a problem. Finally, some of the new quantitative tasks developed for this survey required respondents to use a simple four-function calculator.

In all, approximately 110 new assessment tasks were field tested, and 81 of these were selected for inclusion in the survey, in addition to 85 tasks that were administered in both the young adult and job-seeker assessments. The administration of a common set of simulation tasks in each of the three literacy surveys makes it possible to compare results across time (that is, from the 1985, 1989-90, and 1992 surveys) and across population groups.

A large number of tasks had to be administered in the current survey to ensure the broadest possible coverage of the literacy domains specified. Yet, no individual could be expected to respond to the entire set of 166 simulation tasks. Accordingly, the survey design dictated that each respondent would receive a subset of the total pool of literacy tasks, while at the same time ensuring that each task was administered to a nationally representative sample of adults. The literacy tasks were assigned to sections that could be completed in about 15 minutes, and these sections were then compiled into booklets, each of which could be completed in about 45 minutes. During a personal interview, each survey respondent was asked to complete one booklet of assessment tasks. All tasks were administered in English only, since this was a survey of adults' literacy skills in the English language — not of their proficiencies in other languages.

In addition to performing the literacy tasks, each participant was asked to spend approximately 20 minutes answering a series of questions about his or her background and characteristics. Two versions of this questionnaire were administered, one in English and one in Spanish. The major areas explored included:

- *background and demographics* — country of birth, languages spoken or read, access to reading materials, size of household, educational attainment of parents, age, race/ethnicity, and marital status

- *education* — highest grade completed in school, current aspirations, participation in adult education classes, and education received outside the United States

- *labor market experiences* — current employment status, recent labor market experiences, weekly wages, and occupational attachment

- *income* — personal as well as household income, types of income received

- *activities* — voting, hours spent watching television, frequency and content of newspaper reading, and use of literacy skills for work and leisure

Many of the variables reported in this volume were based on the questions about labor market experiences. These questions gathered information on respondents' labor force status (employed, unemployed, or out of the labor force) the week before the survey; the number of hours worked each week by employed respondents; the industries and occupations in which employed respondents were working at the time of the survey; hourly and weekly earnings; weeks of employment, hours of work, and earnings, from jobs held in the 12 months before the survey; and the frequency with which employees used various reading, writing and mathematics skills on the job.

These background data make it possible to investigate the relationships between particular labor force experiences and demonstrated performance on each of the three literacy scales.[15]

Conducting the Survey

The National Adult Literacy Survey was designed to provide information about the literacy skills of America's adults nationwide and about the performance of those living in various regions of the country. To enable individual states to describe the literacy proficiencies of adults living within their borders, each of the 50 states was invited to participate in a concurrent project, the State Adult Literacy Surveys. This special study would provide state-level results comparable to those of the national survey. Twelve states participated in the state study: California, Florida, Illinois, Indiana, Iowa, Louisiana, New Jersey, New York, Ohio, Pennsylvania, Texas, and Washington.

To permit comparisons of the state and national results, the survey instruments administered to the state and national samples were virtually identical. The only difference was that the state survey instruments included a small number of additional background questions. Further, the data for the national and state surveys were gathered at the same time (except in Florida, which conducted its data collection at a later date).

The survey instruments were administered through in-person interviews conducted by more than 400 trained staff, some of whom were bilingual in English and Spanish. Respondents spent, on average, more than an hour performing a series of diverse literacy tasks and answering a set of background questions on various topics. Survey participants who completed as much of the assessment as their skills allowed were paid $20 for their time.

During the first eight months of 1992, 24,944 adults living in households across the country were interviewed as part of the National and State Adult Literacy Surveys (Table 1). In the national survey, data were gathered for a nationally representative sample of 13,591 adults age 16 and older who were living in households. African American and Latino households were oversampled to ensure reliable estimates of literacy proficiencies and to permit analyses of the performance of these subpopulations. In the state surveys, a random household sample of nearly 1,000 adults age 16 to 64 was interviewed

Table 1—The National Adult Literacy Survey household respondent sample: 1992

	Assessed sample	National population (in millions)	Percent of national population
Total	24,944	190.523	100
Sex			
Male	10,694	91.375	48
Female	14,208	98.858	52
Race/Ethnicity			
White	16,875	144.702	76
Black	4,483	20.852	11
Hispanic	2,915	18.347	10
Asian/Pacific Islander	431	4.112	2
Other	240	2.510	1

SOURCE: U.S. Department of Education, National Center for Education Statistics, National Adult Literacy Survey, 1992.

in each participating state, for a total of 11,353 individuals. The results for each respondent were weighted to derive population estimates representative of the age, sex, and racial/ethnic composition of the nation's civilian population. Responses from the national and state samples (except Florida) were combined to yield the best possible performance estimates.

In addition to the household samples, a random sample of 1,147 adults in federal and state prisons was surveyed. Prisoners were not included in this analysis of the literacy skills of the nation's labor force.[16]

The adult population in the United States in 1992, or the universe of potential respondents, was estimated at 191,289,250, of whom 756,561 were in prison. The 190.5 million working-age individuals (age 16 and older) in the noninstitutional civilian population are the focus of the analyses presented in this report.

Classifying Adults' Labor Force Status

Respondents who participated in the National Adult Literacy Survey were asked to report on their labor force activities during the calendar week immediately preceding the survey. Based on their responses, individuals were assigned to three mutually exclusive categories: employed, unemployed, or out of the labor force. The criteria used to make these designations, described below, conform quite closely to those applied by the U.S. Bureau of the Census and the Bureau of Labor Statistics in conducting and analyzing data from the monthly Current Population Survey.[17]

- *Employed adults* are those who reported working for pay or profit for one or more hours during the reference week (the week before the survey), or who had a job but did not work that week. This category includes three subgroups. The "full-time employed" worked at least 35 hours for pay or profit during the reference week, either in one full-time job or in two or more part-time jobs.[18] The "part-time employed" worked between one and 34 hours for pay or profit during the reference week. Adults who held a job during the reference week but were not at work due to vacation, an industrial dispute, illness, or family/sick leave are classified as "with a job but not at work." These adults cannot be classified as full-time or part-time employed because their usual work hours are unknown.

- *Unemployed adults* are those who reported they were unemployed, laid off, or looking for work during the reference week. This definition of unemployment is somewhat broader than that used by the U.S. Bureau of Labor Statistics in the Current Population Survey, which counts as unemployed only those adults who looked for a job in the past four weeks and were available for work the past week (unless they were on layoff or reporting to a new job in the next 30 days).[19]

- Adults who are *out of the labor force* reported that they were neither employed nor unemployed during the reference week; that is, they were not working, not on layoff, and not looking for work. These include retirees, students, homemakers, and individuals who are ill or disabled.

According to analyses of the National Adult Literacy Survey data, 132.3 million (or 69.4 percent) of the estimated 190.5 million adults age 16 or older in the civilian noninstitutional population in the United States in 1992 were active members of the labor force; that is, they were working, on layoff, or looking for work (Table 2). An estimated 118.8 million of these individuals were employed either full or part time, while the remaining 13.6 million were unemployed. An estimated 58.2 million adults, representing nearly 31 percent of the working-age population, were out of the labor force.[20]

Of the estimated 118.8 million adults employed during the reference week, nearly 90 million (or about three-quarters) were working full time, and

Table 2—Numbers and percentages of adults in various labor force categories: 1992

Labor force category	Number (in millions)	Percent
All	190.5	100
In the labor force	132.3	69
Employed	118.8	62
Unemployed	13.6	7
Out of the labor force	58.2	31

Notes: "Number" refers to the civilian noninstitutional population.

SOURCE: U.S. Department of Education, National Center for Education Statistics, National Adult Literacy Survey, 1992.

23.6 million (or 20 percent) were working part time (Table 3). Five percent, or an estimated 5.4 million adults, had a job but were not at work the week before the survey.[21]

Reporting the Results

Throughout this report, the results of the National Adult Literacy Survey are reported using three scales, each ranging from 0 to 500: a prose scale, a document scale, and a quantitative scale. In some instances, a composite score is used to report on respondents' combined literacy proficiencies. The scores on each scale represent degrees of proficiency along that particular dimension of literacy. For example, a low score (below 225) on the document scale indicates that an individual demonstrates very limited skills in processing information from tables, charts, graphs, maps, and the like, even those that are brief and uncomplicated. He or she may be able to perform more challenging literacy tasks some of the time — for example, when the material is familiar — but would not be expected to do so with a high degree of consistency. On the other hand, a high score (above 375) indicates that a person displays advanced skills in performing a variety of tasks that involve the use of complex documents. He or she would be expected to process information from challenging materials with a high degree of consistency. (The probabilities of adults with different proficiencies responding correctly to the assessment tasks in each literacy level are discussed further in Chapter One.)

Table 3—Numbers and percentages of adults in various employed subgroups: 1992

Employed subgroup	Number (in millions)	Percent
Total	118.8	100
Employed full time	89.7	76
Employed part time	23.6	20
With a job, but not at work	5.4	5

Notes: "Number" refers to the employed population.

SOURCE: U.S. Department of Education, National Center for Education Statistics, National Adult Literacy Survey, 1992.

Survey participants obtained proficiency scores according to their performance on the survey tasks. A relatively small proportion of the respondents answered only a part of the survey, and an imputation procedure was used to make the best possible estimates of their proficiencies. This procedure and related issues are detailed in the forthcoming technical report.

Most respondents tended to obtain similar scores on the three literacy scales, but this does not mean that the underlying skills involved in prose, document, and quantitative literacy are the same. Each scale provides some unique information, especially when comparisons are made across groups defined by variables such as race/ethnicity, education, and age.

The literacy scales allow us not only to summarize results for various subpopulations, but also to determine the relative difficulty of the literacy tasks included in the survey. In other words, just as individuals earned scale scores according to their performance in the assessment, the literacy tasks received scale values according to their difficulty, as determined by the performance of the nationally representative sample of adults who participated in the survey. Previous research has shown that the difficulty of a literacy task, and therefore its placement on the literacy scale, is determined by three factors: the structure of the material (for example, exposition, narrative, table, graph, map, or advertisement); the content of the material and/or the context from which it is drawn (for example, home, work, or community); and the nature of the task (that is, what the individual is asked to do with the material, or his or her purpose for using it).

The literacy tasks administered in the survey varied widely in terms of materials, content, and task requirements, and thus in terms of difficulty. This range is captured in Figure 1, which describes some of the literacy tasks on each of the three scales and indicates their scale values. Even a cursory review of this display reveals that tasks at the lower end of each scale differ from ones at the high end. A careful analysis of the range of tasks along each scale reveals an ordered set of information-processing skills and strategies. On the prose scale, for example, tasks with low scale values ask readers to locate or identify information in brief, familiar, or uncomplicated materials, while those at the high end ask them to perform more demanding activities using materials that tend to be lengthy, unfamiliar, or complex. Similarly, on the document and quantitative scales, the tasks at the low end of the scale differ from those at the high end in terms of the structure of the material, the content and context of the material, and the nature of the directive.

In an attempt to capture this progression of information-processing skills and strategies, each scale was divided into five levels:

	Score range
Level 1	0 to 225
Level 2	226 to 275
Level 3	276 to 325
Level 4	326 to 375
Level 5	376 to 500

The points and score ranges that separate the levels on each scale reflect shifts in the literacy skills and strategies required to complete increasingly complex tasks. Analyses of the types of materials and demands that characterize each level reveal the progression of literacy demands along each scale (Figure 2).

While the literacy levels on each scale can be used to explore the range of literacy demands, they do not reveal the types of literacy demands that are associated with particular contexts in this pluralistic society. That is, they do not enable us to say what specific level of prose, document, or quantitative skill is required to obtain or hold a job, or advance in a particular occupation, to manage a household, or to obtain legal or community services, for example. Nevertheless, the relationships among performance on the three scales and various social or economic indicators can provide valuable insights about their importance for success in various aspects of life.

Figure 1

Difficulty Values of Selected Tasks Along the Prose, Document, and Quantitative Literacy Scales

	Prose	Document	Quantitative
0	149 Identify country in short article 210 Locate one piece of information in sports article 224 Underline sentence explaining action stated in short article	69 Sign your name 151 Locate expiration date on driver's license 180 Locate time of meeting on a form 214 Using pie graph, locate type of vehicle having specific sales	191 Total a bank deposit entry
225	226 Underline meaning of a term given in government brochure on supplemental security income 250 Locate two features of information in sports article	232 Locate intersection on a street map 245 Locate eligibility from table of employee benefits 259 Identify and enter background information on application for social security card	238 Calculate postage and fees for certified mail 246 Determine difference in price between tickets for two shows 270 Calculate total costs of purchase from an order form
275	275 Interpret instructions from an appliance warranty 280 Write a brief letter explaining error made on a credit card bill 304 Read a news article and identify a sentence that provides interpretation of a situation 316 Read lengthy article to identify two behaviors that meet a stated condition	277 Identify information from bar graph depicting source of energy and year 296 Use sign out sheet to respond to call about resident 314 Use bus schedule to determine appropriate bus for given set of conditions 323 Enter information given into an automobile maintenance record form	278 Using calculator, calculate difference between regular and sale price from an advertisement 308 Using calculator, determine the discount from an oil bill if paid within 10 days
325	328 State in writing an argument made in lengthy newspaper article 347 Explain difference between two types of employee benefits 359 Contrast views expressed in two editorials on technologies available to make fuel-efficient cars 362 Generate unfamiliar theme from short poems 374 Compare two metaphors used in poem	342 Identify the correct percentage meeting specified conditions from a table of such information 348 Use bus schedule to determine appropriate bus for given set of conditions	325 Plan travel arrangements for meeting using flight schedule 331 Determine correct change using information in a menu 350 Using information stated in news article, calculate amount of money that should go to raising a child 368 Using eligibility pamphlet, calculate the yearly amount a couple would receive for basic supplemental security income
375	382 Compare approaches stated in narrative on growing up 410 Summarize two ways lawyers may challenge prospective jurors 423 Interpret a brief phrase from a lengthy news article	379 Use table of information to determine pattern in oil exports across years 387 Using table comparing credit cards, identify the two categories used and write two differences between them 396 Using a table depicting information about parental involvement in school survey to write a paragraph summarizing extent to which parents and teachers agree	375 Calculate miles per gallon using information given on mileage record chart 382 Determine individual and total costs on an order form for items in a catalog 405 Using information in news article, calculate difference in times for completing a race 421 Using calculator, determine the total cost of carpet to cover a room
500			

Source: U.S. Department of Education, National Center for Education Statistics, National Adult Literacy Survey, 1992

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Figure 2

Description of the Prose, Document, and Quantitative Literacy Levels

	Prose	Document	Quantitative
Level 1 *0-225*	Most of the tasks in this level require the reader to read relatively short text to locate a single piece of information which is identical to or synonymous with the information given in the question or directive. If plausible but incorrect information is present in the text, it tends not to be located near the correct information.	Tasks in this level tend to require the reader either to locate a piece of information based on a literal match or to enter information from personal knowledge onto a document. Little, if any, distracting information is present.	Tasks in this level require readers to perform single, relatively simple arithmetic operations, such as addition. The numbers to be used are provided and the arithmetic operation to be performed is specified.
Level 2 *226-275*	Some tasks in this level require readers to locate a single piece of information in the text; however, several distractors or plausible but incorrect pieces of information may be present, or low-level inferences may be required. Other tasks require the reader to integrate two or more pieces of information or to compare and contrast easily identifiable information based on a criterion provided in the question or directive.	Tasks in this level are more varied than those in Level 1. Some require the readers to match a single piece of information; however, several distractors may be present, or the match may require low-level inferences. Tasks in this level may also ask the reader to cycle through information in a document or to integrate information from various parts of a document.	Tasks in this level typically require readers to perform a single operation using numbers that are either stated in the task or easily located in the material. The operation to be performed may be stated in the question or easily determined from the format of the material (for example, an order form).
Level 3 *276-325*	Tasks in this level tend to require readers to make literal or synonymous matches between the text and information given in the task, or to make matches that require low-level inferences. Other tasks ask readers to integrate information from dense or lengthy text that contains no organizational aids such as headings. Readers may also be asked to generate a response based on information that can be easily identified in the text. Distracting information is present, but is not located near the correct information.	Some tasks in this level require the reader to integrate multiple pieces of information from one or more documents. Others ask readers to cycle through rather complex tables or graphs which contain information that is irrelevant or inappropriate to the task.	In tasks in this level, two or more numbers are typically needed to solve the problem, and these must be found in the material. The operation(s) needed can be determined from the arithmetic relation terms used in the question or directive.
Level 4 *326-375*	These tasks require readers to perform multiple-feature matches and to integrate or synthesize information from complex or lengthy passages. More complex inferences are needed to perform successfully. Conditional information is frequently present in tasks at this level and must be taken into consideration by the reader.	Tasks in this level, like those at the previous levels, ask readers to perform multiple-feature matches, cycle through documents, and integrate information; however, they require a greater degree of inferencing. Many of these tasks require readers to provide numerous responses but do not designate how many responses are needed. Conditional information is also present in the document tasks at this level and must be taken into account by the reader.	These tasks tend to require readers to perform two or more sequential operations or a single operation in which the quantities are found in different types of displays, or the operations must be inferred from semantic information given or drawn from prior knowledge.
Level 5 *376-500*	Some tasks in this level require the reader to search for information in dense text which contains a number of plausible distractors. Others ask readers to make high-level inferences or use specialized background knowledge. Some tasks ask readers to contrast complex information.	Tasks in this level require the reader to search through complex displays that contain multiple distractors, to make high-level text-based inferences, and to use specialized knowledge.	These tasks require readers to perform multiple operations sequentially. They must disembed the features of the problem from text or rely on background knowledge to determine the quantities or operations needed.

Source: U.S. Department of Education, National Center for Education Statistics, National Adult Literacy Survey, 1992.

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A Note on Interpretations

It is important to recognize that, even when differences are found among various groups, the nature of the survey does not allow us to determine the specific direction of these relationships. In other words, it is not possible to identify the extent to which literacy shapes particular aspects of our lives or is, in turn, shaped by them. For example, there is a strong relationship between educational attainment and literacy proficiencies. On the one hand, it is likely that staying in school longer (up to some point) strengthens individuals' literacy skills. On the other hand, longitudinal research indicates that those with more advanced skills tend to stay in school longer. Other variables (family income, socioeconomic status of parents) are also likely to play a role in the relationship between literacy and education.

In addition, when comparing the literacy skills of different groups, the range of performance within each group must be kept in mind. While this report describes the literacy proficiencies of subpopulations defined by variables such as age, sex, race/ethnicity, educational background, and occupational attachment, clearly the individuals within these groups are not homogeneous with respect to either their characteristics or their proficiencies. Within every group there are some individuals who perform well and some who perform poorly. Accordingly, when one group is said to have lower average scores than another, this does not imply that all adults in the first group performed worse than all those in the second. Such statements are only intended to highlight general patterns of differences among various groups and do not capture the full variability within each group.

Above all, the survey results show us that no single factor determines what an individual's literacy proficiencies will be. All of us develop our own unique repertoire of competencies depending on a wide array of conditions, behaviors, and circumstances, including our family backgrounds, educational attainments, interests and aspirations, economic resources, literacy behaviors, and employment experiences. Any single survey, this one included, can focus on only some of these variables.

An Overview of the Remaining Chapters

The following chapters present key findings from an analysis of National Adult Literacy Survey data on the literacy proficiencies of the nation's civilian labor force. Chapter One reviews findings on the literacy proficiencies of the nation's entire civilian labor force and the employed and unemployed populations. Chapter Two presents information about the estimated literacy skills of selected demographic and socioeconomic subgroups of the labor force, defined by sex, age, race/ethnicity, educational attainment, poverty status, disability status, and region of residence. Chapter Three examines the literacy proficiencies of the employed in major industries and occupations, assesses the literacy skills of front-line blue collar workers in the nation's goods-producing industries and of workers in health-related industries, and analyzes the literacy implications of projected changes in the nation's occupational employment structure from the early 1990s to the year 2005.

The literacy proficiencies of adults should not only influence their willingness to participate in the labor market, their overall employability, and their access to particular types of jobs, but also their weekly and annual earnings from employment. Chapter Four explores the relationships between employees' proficiencies and their weekly and annual earnings. This chapter also explores the degree to which workers report using their reading, writing, and mathematics skills on the job and the influence of intensity of use on annual earnings. Chapter Five reviews data on current school enrollment, educational attainment, and past participation in basic skills programs among adults in the labor force. The literacy skills of the unemployed, underemployed, labor force reserves, and poor are examined more fully in Chapter Six. Chapter Seven provides detailed findings from multivariate statistical analyses of the estimated effects of literacy proficiencies on the employment and earnings experiences of the adult population overall and of those in key subgroups. Finally, Chapter Eight summarizes the main findings of the report and assesses their implications for business, labor, and government, and for future human resource policies and programs at the national, state, and local level.

Endnotes

1. For a review of findings from the NAEP assessments, see: Ina V.S. Mullis, Eugene H. Owen, and Gary Phillips, *America's Challenge: Accelerating Academic Achievement*, Educational Testing Service, Princeton, 1990. For a review of the 1980 High School and Beyond Survey, see: (i) Samuel S. Peng, William B. Fetters, Andrew J. Kolstad, *High School and Beyond: A National Longitudinal Study for the 1980s, A Capsule Description of High School Seniors*, U.S. Department of Education, Washington, D.C., 1981; (ii) National Center for Education Statistics, *High School and Beyond, A National Longitudinal Study for the 1980s, Two Years of High School: The Status of 1980 Sophomores in 1982*, U.S. Government Printing Office, Washington, D.C., 1984.

2. See: (i) Office of the Assistant Secretary of Defense, *Profile of American Youth: 1980 Nationwide Administration of the Armed Services Vocational Aptitude Battery*, Washington, D.C., March 1982; (ii) Andrew Sum, Paul Harrington, and William Goedicke, *Basic Skills of America's Teens and Young Adults: Findings of the 1980 National ASVAB Testing and Their Implications for Education, Employment, and Training Programs*, Report Prepared for the Ford Foundation, New York, 1986; (iii) Irwin Kirsch and Ann Jungeblut, *Literacy: Profiles of America's Young Adults — Final Report*, National Assessment of Educational Progress, Princeton, 1986.

3. See: Irwin S. Kirsch, Ann Jungeblut, and Anne Campbell, *Beyond the School Doors: The Literacy Needs of Job Seekers Served by the U.S. Department of Labor*, Educational Testing Service, Princeton, 1992.

4. See: Irwin S. Kirsch, Ann Jungeblut, Lynn Jenkins, and Andrew Kolstad, *Adult Literacy in America: A First Look at the Results of the National Adult Literacy Survey*. National Center for Education Statistics, U.S. Department of Education, Washington, D.C., 1993.

5. See: Frederick H. Harbison, *Human Resources as the Wealth of Nations*, Oxford University Press, New York, 1973.

6. Ibid, p. 4.

7. See: Ray Marshall and Marc Tucker, *Thinking for a Living*, Basic Books, New York, 1992.

8. See: (i) The Commission on the Skills of the American Workforce, *America's Choice: High Skills or Low Wages!*, National Center on Education and the Economy, Rochester, June 1990; (ii) Peter B. Doeringer, et al., *Turbulence in the American Workplace*, Oxford University Press, New York, 1991; (iii) Anthony Patrick Carnevale, *America and the New Economy*, Jossey-Bass Publishers, San Francisco, 1991; (iv) Gordon Berlin and Andrew Sum, *Toward A More Perfect Union: Basic Skills, Poor Families, and Our Economic Future*, Ford Foundation, New York, 1989.

9. See: The National Commission on Excellence in Education, *A Nation at Risk: The Imperative for Educational Reform*, Washington, D.C., 1983.

10. See: (i) William B. Johnston and Arnold E. Packer, *Workforce 2000: Work and Workers for the Twenty-First Century*, Hudson Institute, Indianapolis, 1987; (ii) U.S. Department of Labor, U.S. Department of Education, and U.S. Department of Commerce, *Building a Quality Workforce*, U.S. Government Printing Office, Washington, D.C., 1988.

11. See: (i) Lawrence Mishel and Ruy Teixeira, *The Myth of the Coming Labor Shortage: Jobs, Skills, and Incomes of America's Workforce 2000*, Economic Policy Institute, Washington, D.C., 1991; (ii) Lawrence Mishel and Ruy Teixeira, "The Myth of the Coming Labor Shortage," *The American Prospect*, Fall 1991, pp. 98-103.

12. See: The Commission on the Skills of the American Workforce, *America's Choice: High Skills or Low Wages!*, National Center on Education and the Economy, Rochester, 1990.

13. See: Irwin S. Kirsch and Ann Jungeblut, *Literacy: Profiles of America's Young Adults, Final Report*, National Assessment of Educational Progress, Princeton, 1986.

14. See: Irwin S. Kirsch, Ann Jungeblut, and Anne Campbell, *Beyond the School Doors: The Literacy Needs of Job Seekers Served by the U.S. Department of Labor*, Educational Testing Service, Princeton, September 1992.

15. See: Anne Campbell, Irwin S. Kirsch, and Andrew Kolstad, *Assessing Literacy: The Framework for the National Adult Literacy Survey*, Educational Testing Service, Princeton, September 1992. For a review of the background

questions administered in the survey, see: Educational Testing Service, *Using Printed Materials, A Survey of America's Adults, NALS: English Background Questionnaire*, Princeton, 1991.

16. While prison inmates were surveyed, residents of other institutions, such as jails, juvenile homes, long-stay hospitals, and nursing homes, were excluded, as were members of the nation's armed forces living on bases in the United States or abroad. For information on literacy in the prison population, see: Karl O. Haigler, Caroline Harlow, Patricia O'Connor, and Anne Campbell, *Literacy Behind the Prison Walls*, National Center for Education Statistics, U.S. Department of Education, Washington, D.C., 1994.

17. For a detailed review of the labor force concepts and measures underlying the Current Population Survey, see: U.S. Department of Labor, Bureau of Labor Statistics, and U.S. Department of Commerce, Bureau of the Census, *Concepts and Methods Used in Labor Force Statistics Derived from the Current Population Survey*, BLS Report No. 463, U.S. Government Printing Office, Washington, D.C., 1976. A briefer technical discussion of the Current Population Survey labor force concepts and measures can be found in the monthly Bureau of Labor Statistics publication *Employment and Earnings*.

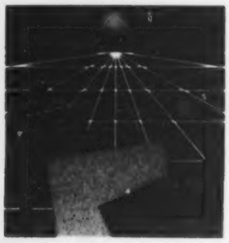
18. Adults who worked without pay in a family-owned business for 15 or more hours during the reference week were not counted as employed because these individuals could not be identified using information from the National Adult Literacy Survey background questionnaire. This is the only group included in the Current Population Survey estimates of the employed but excluded from this analysis. There were an estimated 345,000 unpaid family workers in the United States in 1992, of whom 113,000 worked in agriculture. See: U.S. Bureau of Labor Statistics, *Employment and Earnings*, January 1993, "Table 23", p. 201.

19. In the Current Population Survey, two unemployed groups were exempt from the active job search criterion prior to 1994: jobless persons on layoff and those waiting to report to a new job in the next 30 days. Further, neither the availability for work nor the recent job search criterion were required to count jobless respondents as unemployed in the NALS. The background questionnaire did not ask jobless respondents whether they were available for work during the reference week, and data on recent job search activities could not be linked to any one subgroup of the unemployed, such as those looking for work or on layoff. Analyses indicated that about 27 percent of unemployed

respondents had not looked for a job in the past four weeks. National Adult Literacy Survey estimates of the number of unemployed adults can therefore be expected to be higher than 1992 Current Population Survey estimates. Analysis of Current Population Survey data for March 1992 revealed that about 766,000 jobseekers, a number equivalent to 7.6 percent of the total number of unemployed, were not available for work. The number of unemployed persons that month would have been about 8 percent higher than the official estimates if the availability for work criterion were not imposed.

20. Based on the Current Population Survey, the U.S. Census Bureau has estimated that there were 191.6 million adults in the civilian noninstitutional population in this country in 1992, of whom 127 million (or 67 percent) were active members of the labor force and 64.6 million (or 34 percent) were out of the labor force. These figures vary somewhat from the National Adult Literacy Survey estimates, primarily as a result of the more stringent definition of unemployment used. While the estimates of the pool of employed persons from the two surveys are within 1.1 million (or 1 percent) of each other, the estimated number of unemployed adults is nearly 4.2 million higher in the National Adult Literacy Survey than in the Current Population Survey, and the estimated pool of adults out of the labor force is roughly 6.4 million lower.

21. This estimate is close to the 1992 annual average Current Population Survey estimate of 6.1 million. See: U.S. Bureau of Labor Statistics, *Employment and Earnings*, January 1993, "Table 29," p. 210.



CHAPTER ONE

The Literacy Proficiencies of the Nation's Labor Force

As noted in the Introduction to this report, literacy is widely regarded as a critical human resource that helps to determine individual and national economic well-being. Accordingly, the first objective of this report is to explore the range of literacy proficiencies in the United States labor force. This chapter presents information on the mean and median prose, document, and quantitative proficiencies of various subgroups of the labor force and the percentages who performed in each of the five levels on each literacy scale. The implications of these findings are considered.

Mean and Median Literacy Proficiencies of the Labor Force

The results of the National Adult Literacy Survey are reported on three literacy scales — prose, document, and quantitative — each ranging from 0 to 500. The score points along these scales represent varying degrees of literacy skill. A very low score (below 225) indicates that an individual demonstrates limited skills in processing information from printed materials, while a high score (above 375) indicates that a person displays advanced skills in performing a wide array of literacy tasks.

Average scores, or "proficiencies," on each scale offer a way to describe literacy skills in general terms. The mean scores for the entire adult population (age 16 and older) in this country are 272 on the prose scale, 267 on the document scale, and 271 on the quantitative scale (Table 1.1).

The mean literacy scores of the civilian labor force — 284 on the prose scale, 280 on the document scale, and 285 on the quantitative scale — are higher than those of the adult population as a whole (Table 1.2). This is not surprising, given that the labor force includes a relatively small proportion of older adults (age 65 and older), who tend to have lower proficiencies than younger adults. Even among the non-elderly, however, the mean scores of labor force participants are significantly higher than those of their counterparts who are neither working nor looking for work.

The median score offers another way to look at average performance results, one that is not influenced by extreme values at either end of the score

Table 1.1—Mean literacy proficiencies of the entire adult population: 1992

Literacy scale	Mean proficiency
Prose	272 (0.6)
Document	267 (0.7)
Quantitative	271 (0.7)

Notes: N = 191.3 million. Numbers in parentheses are standard errors.

SOURCE: U.S. Department of Education, National Center for Education Statistics, National Adult Literacy Survey, 1992.

Table 1.2—Mean and median literacy proficiencies and percentile ranks of the labor force: 1992

Literacy scale	Mean proficiency	Median proficiency	Percentile rank
Prose	284 (0.6)	291	57
Document	280 (0.7)	286	58
Quantitative	285 (0.7)	291	57

Notes: N = 132.2 million. Numbers in parentheses are standard errors.

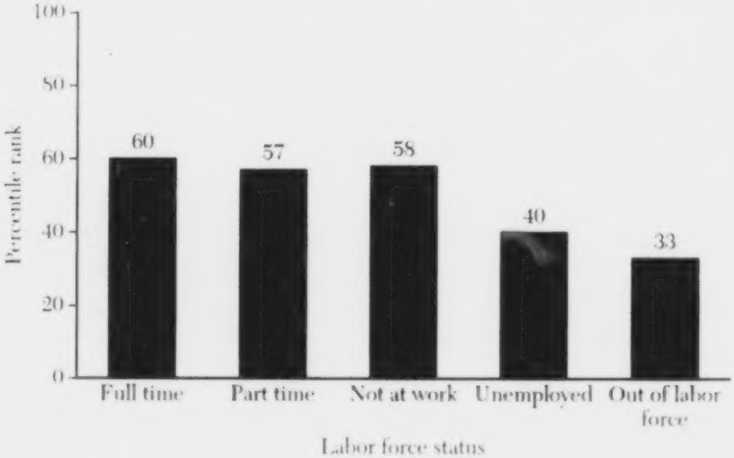
SOURCE: U.S. Department of Education, National Center for Education Statistics, National Adult Literacy Survey, 1992.

distribution. The median score divides the entire proficiency distribution on each scale into two equal parts: half the labor force has scores below the median and the other half has scores above it.

On the document scale, the median score of adults in the labor force is 286, while on the prose and quantitative scales it is 291. If the labor force's proficiencies were normally distributed — in other words, if roughly equivalent proportions scored at the low and high ends of each scale — then the mean and median proficiencies would be identical. The score distributions tend to be slightly skewed to the low end, however. On each of the scales, the mean proficiencies of the civilian labor force are 6 to 7 points lower than the median proficiencies. This means that the percentage of adults in the labor force who performed well below the mean (two or more standard deviations) is higher than the percentage who scored well above the mean. Although this finding may seem surprising, it should be recalled that the labor force includes many immigrants who do not know English or who learned it as a second language and who therefore have low literacy proficiencies in English.

On each literacy scale, the median literacy proficiencies of labor force participants are equal to the 57th or 58th percentile of the score distribution for the entire adult population (Figure 1.1). In other words, adults in the labor force outperformed the adult population as a whole. These findings indicate that the literacy skills of individuals who are either working or looking for work are, on average, well above those for adults who are not in the labor force. On each of the three scales, the median proficiencies of these nonparticipants are equivalent to only the 33rd percentile for all adults.

Figure 1.1—Percentile rankings of the median prose proficiencies of adults, by labor force status: 1992



SOURCE: U.S. Department of Education, National Center for Education Statistics, National Adult Literacy Survey, 1992.

Range of Performance on the Literacy Tasks

The literacy scales developed to report the survey results make it possible not only to summarize the literacy proficiencies of the total population and of various subpopulations, but also to determine the relative difficulty of the literacy tasks administered in the survey. That is, just as an individual receives a score according to his or her performance on the assessment tasks, each task receives a value according to its difficulty as determined by the combined performance of the survey respondents. Previous research conducted by Educational Testing Service has shown that the difficulty of a literacy task, and thus its placement on a particular literacy scale, is determined by three factors: the structure or linguistic format of the material, the content and/or the context from which the material is selected, and the nature of the task, or what the individual is asked to do with the material.

As shown in Figure 1 in the Introduction to this report, each literacy task was assigned a score point (or "difficulty value") representing the point at which individuals with that proficiency score have a high probability of responding correctly. An 80 percent probability of correct response was the criterion used. While some tasks were at the very low end of the scale and some at the very high end, most had difficulty values in the 200 to 400 range.

Assigning scale values to both people and tasks makes it possible to analyze how well individuals with varying proficiencies performed on tasks of varying difficulty. While respondents tend to perform well on tasks with difficulty values equivalent to or below their proficiency scores, they are less likely to succeed on tasks with higher difficulty values. This does not mean that individuals can never succeed on challenging literacy tasks — that is, on tasks whose difficulty values are higher than their proficiencies. They may do so some of the time. Rather, it means that their probability of success is not as high. In other words, the more difficult the task relative to adults' skills, the lower their chance of responding correctly.

To explore the range of literacy proficiencies in the labor force, the authors selected a set of literacy tasks with varying difficulty values along each scale. Table 1.3 briefly describes these tasks, presents their difficulty values, and indicates the corresponding percentages of adults in the labor force with proficiencies equal to or higher than these values — and who can therefore be expected to succeed on such tasks consistently (that is, at least 80 percent of the time).

Table 1.3—Difficulty values of selected tasks on the literacy scales and the percentage of the labor force with proficiencies at or above these values: 1992

Difficulty value	Prose task description	Percent at or above value
149	Identify country in short article	96
210	Locate one piece of information in sports article	90
224	Underline sentence explaining action in short article	87
236	Underline meaning of term in government brochure on Supplemental Security Income	85
250	Locate two pieces of information in sports article	76
275	Interpret instructions from appliance warranty	61
280	Write brief letter explaining error made on credit card bill	52
304	Read news article and identify sentence interpreting situation	41
316	Read lengthy article to identify two behaviors that meet stated condition	32
328	State in writing an argument made in lengthy newspaper article	24
347	Explain difference between two types of employee benefits	14
359	Contrast views expressed in two editorials on technologies for making fuel-efficient cars	9
362	Generate unfamiliar theme from short poems	8
374	Compare two metaphors in poem	5
382	Compare approaches stated in narrative on growing up	4
410	Summarize two ways lawyers may challenge prospective jurors	1
423	Interpret brief phrase from lengthy news article	1

SOURCE: U.S. Department of Education, National Center for Education Statistics, National Adult Literacy Survey, 1992.

On the prose scale, 90 to 96 percent of adults in the work force demonstrated a high rate of success on tasks such as identifying the name of a country appearing in a short news article or locating a piece of information in a short sports article. As the prose tasks became more complex, the percentages of labor force participants who were likely to respond correctly dropped. While 76 percent were likely to succeed on tasks such as locating two pieces of information in the previously mentioned sports article, lower percentages

Table 1.3—continued

Difficulty value	Document task description	Percent at or above value
69	Sign your name	99
151	Locate expiration date on driver's license	95
180	Locate time of meeting on form	94
214	Using pie graph, locate vehicle with specific sales	88
232	Locate intersection on street map	83
245	Locate eligibility from table of employee benefits	76
259	Identify and enter background information on application for Social Security card	69
277	Identify information from bar graph depicting source of energy and year	57
296	Use sign out sheet to respond to call about resident	42
314	Use bus schedule to determine appropriate bus for given set of conditions	30
323	Enter information given into automobile maintenance record form	25
342	Use table to identify correct percentage who meet specified conditions	14
348	Use bus schedule to determine appropriate bus for given set of conditions	10
378	Use information in table to complete graph, label axes	3
379	Use table to determine pattern in oil exports across years	3
387	Use table to compare credit cards; identify two categories used and write two differences between them	2
396	Use table on survey to write paragraph summarizing extent to which parents and teachers agree	2

SOURCE: U.S. Department of Education, National Center for Education Statistics, National Adult Literacy Survey, 1992.

demonstrated the ability to write a brief letter explaining an error made on a credit card bill (52 percent), summarize an argument made in a lengthy newspaper article (24 percent), and contrast views expressed in two separate editorials on technologies for improving automobile fuel efficiency (9 percent). Thus, many members of the labor force in this country appear to lack the types of sophisticated processing skills needed to interpret, integrate, and compare or contrast relatively complex information using printed and written materials commonly encountered at home and in the community and workplace.

Table 1.3—continued

Difficulty value	Quantitative task description	Percent at or above value
191	Total a bank deposit entry	93
238	Calculate postage and fees for certified mail	81
246	Determine difference in ticket price for two shows	78
270	Calculate total costs of purchase from order form	65
278	Using calculator, calculate difference between regular and sale price from advertisement	60
308	Using calculator, determine discount from oil bill if paid within 10 days	38
325	Plan travel arrangements for meeting using flight schedule	27
331	Determine correct change using information in menu	23
350	Using information in news article, calculate amount of money that should go to raising a child	14
368	Using eligibility pamphlet, calculate yearly amount a couple would receive for basic Supplemental Security Income	8
375	Calculate miles per gallon using information given on mileage record chart	6
382	Determine individual and total costs on order form for catalog items	4
405	Using information in news article, calculate difference in times for completing a race	2
421	Using calculator, determine total cost of carpet for room	1

SOURCE: U.S. Department of Education, National Center for Education Statistics, National Adult Literacy Survey, 1992

The document tasks described in Table 1.3 represent a range of difficulty and complexity. Nearly all members of the United States work force (more than 99 percent) demonstrated the ability to perform tasks such as signing their name on a Social Security form. Similarly, very large percentages (94 to 95 percent) displayed the skills needed to locate a single piece of information in a relatively simple document, such as a driver's license or meeting form. When asked to fill in required background information on an application for a Social Security card, however, only 69 percent had a document score at or above the difficulty value of the task, and just 25 percent were likely to be successful in locating and entering the appropriate information onto a form identifying automobile maintenance activities. The most difficult tasks appeared to be those that required respondents to interpret, compare, or graphically depict data presented in tables. Ten percent of the work force or less had proficiencies equal to or greater than the difficulty values of these types of document tasks.

Performance on the quantitative tasks was also quite varied. Ninety-three percent of adults in the labor force demonstrated the ability to add two given entries on a bank deposit slip. When the task involved searching for information in an order form and using it to calculate the total costs of a purchase, however, the proportion who were likely to succeed was far smaller. Approximately two-thirds of the labor force had quantitative scores high enough to perform that task with at least an 80 percent probability of success. When the task entailed searching for information in a document such as a pamphlet, order form, or newspaper and selecting the appropriate arithmetic operations to use, less than 10 percent were likely to respond correctly, even when given hand-held calculators to compute their answers.

Another way to examine the range of literacy skills in the labor force is to gather information about the dispersion of scores around the averages. Table 1.4 presents the proficiencies of adults at 10 percentage point increments along each literacy scale and of those performing in the top 1 percent.

On the prose scale, the bottom 10 percent of the labor force had scores of 209 or below, while the bottom 20 percent had scores of 241 or below. The median prose score (50th percentile) was 291. In the upper end of the performance spectrum, the top 20 percent of the labor force had scores of 335 or higher, and the top 10 percent had scores of 356 or higher. The top 1 percent of the labor force had a prose score at or above 400. The results for the document and quantitative scales closely parallel those for the prose scale.

Overall, this analysis of the distribution of literacy proficiencies among members of the labor force reveals considerable variation, with standard deviations of 61 to 63 points on each scale. The differences in scores between the top and bottom 20 percent of the labor force are quite substantial.

What are the implications of these performance disparities? Numerous analysts of the American work force have argued that the substantial gap in literacy skills between professional and managerial workers and front-line workers reduces the productivity potential of the work force and inhibits the creation of high-performance workplaces, which are believed to be needed to boost labor productivity in the future. Many believe that major international competitors, including Germany and Japan, have been far more successful than the United States in narrowing the skills gap between the upper and lower echelons of the labor force.[1] James Fallows, for example, has argued that the bottom half of the Japanese work force may be the best educated in the world.[2]

Table 1.4—Proficiencies of the labor force at 10 percentile increments on each literacy scale: 1992

Percentile	Prose	Proficiency Document	Quantitative
10th	209	205	205
20th	241	237	240
30th	261	256	261
40th	276	272	277
50th	291	286	291
60th	304	300	305
70th	318	314	319
80th	335	330	336
90th	356	351	359
99th	402	397	408

SOURCE: U.S. Department of Education, National Center for Education Statistics, National Adult Literacy Survey, 1992.

Unfortunately, detailed information about the literacy skills of the labor force in other major industrial nations is not yet available. A forthcoming international adult literacy assessment, scheduled for 1995, should yield valuable information on these issues.

Distribution Across the Literacy Levels

Another way to explore the distribution of literacy skills in the labor force is to examine the percentages of individuals who scored within the range for each of the five proficiency levels on each literacy scale: Level 1 (0 to 225), Level 2 (226 to 275), Level 3 (276 to 325), Level 4 (326 to 375), and Level 5 (376 to 500). Using the literacy levels, one can determine whether the individuals in one group were more likely than those in another group to demonstrate skills in the lowest, or the highest, levels on each literacy scale. As noted in the Introduction, the range of literacy skills and strategies that characterize each level on each scale were defined by examining the types of tasks that were likely to be performed successfully by adults who scored in the range for that level.[3]

In considering the literacy levels, it is important to remember that each level encompasses a range of performance. As a result, the tasks in any given level are not all of the same difficulty; neither are the individuals who demonstrated skills in that level identical in literacy proficiency. Tasks with difficulty values in the high end of the range for a given level are more challenging than those in the low end. Similarly, individuals whose proficiencies are in the high end of a level demonstrated success on a more challenging set of literacy tasks than individuals in the low end. The performance of adults in Level 1 is especially heterogeneous, as this level includes individuals who successfully performed only the least demanding literacy tasks in the survey, those who attempted to perform these tasks but seldom succeeded, and those who had such limited skills (or such limited English proficiency) that they did not try to respond to any of the assessment tasks. Thus, while the literacy levels are discussed as distinct units in this section and other parts of the report, the range of performance within each level should be kept in mind.

The distribution of the nation's labor force across the levels on each literacy scale reveals a relatively high concentration of respondents in the two lowest levels and a far smaller proportion in the two highest levels (Table 1.5). Fourteen to 16 percent of the work force in 1992 scored in Level 1 on the prose, document, and quantitative proficiency scales, and another 25 to 27 percent scored in Level 2. Stated differently, 40 to 43 percent of the nation's adults who were active in the labor force performed in the two lowest levels on each scale, earning scores between 0 and 275. At the other end of the spectrum, only one-fifth of the work force performed in Level 4 and just 3 to 5 percent attained Level 5 on each scale.

These findings indicate that a substantial fraction of our nation's labor force displays quite limited proficiencies in the three areas of literacy assessed. The tasks that adults in Levels 1 and 2 were most likely to be able to perform successfully appear to fall far short of the types of assignments that one would

Table 1.5—Distribution of the labor force across the literacy levels: 1992

	Percent in level...				
Literacy scale	**1**	**2**	**3**	**4**	**5**
Prose	14	25	35	21	4
Document	16	27	35	19	3
Quantitative	15	25	35	21	5

Notes: N = 132.2 million

SOURCE: U.S. Department of Education, National Center for Education Statistics, National Adult Literacy Survey, 1992.

expect workers in professional, managerial, technical, high-level sales, skilled clerical, and craft or precision production occupations to be given on a regular basis. For an economy that has supposedly moved into the "information age" and is becoming dependent on high-performance workplaces to spur economic growth, competitiveness, and productivity, many members of the existing labor force appear ill-equipped with respect to key literacy proficiencies.

Adults who performed in the highest literacy level on each scale can be expected to perform well on a wide array of literacy tasks. Unfortunately, only small percentages of the work force in this country had prose, document, or quantitative scores in this range (376 to 500). Further, the short-term outlook for increasing the percentages of adults who attain the highest literacy levels is not very promising. Findings of the NAEP assessments reveal either no changes or slight declines over time in the percentage of 17-year-olds with high proficiencies.[4]

Mean Literacy Proficiencies by Labor Force Subgroup

To this point, the focus has been on the literacy skills of the labor force as a whole. One would expect performance to vary among different subgroups of the labor force, and the survey data support this expectation (Table 1.6). Mean prose, document, and quantitative scores are generally highest for adults employed full time, followed by individuals who were employed but not at work, those working part time, the unemployed, and adults who were out of the labor force. The differences in mean scores between the full-time employed and those in each other labor force subgroup except those employed but not at work are statistically significant at the .05 or .01 level.[5] The mean prose proficiencies of full-time employees are statistically equivalent to those of adults who were employed but not working at the time of the survey.

On the prose scale, mean scores range from a high of 288 for the full-time employed and 284 for the part-time employed to 260 for the unemployed and a low of 246 for adults not actively participating in the labor force. The gap of 28 points between the mean prose scores of the full-time employed and the unemployed is equal to nearly .5 standard deviations, while the 43-point gap between the mean scores of the full-time employed and those out of the labor force is equivalent to .7 standard deviations, a very sizable difference.[6] Clearly, adults in the labor force and working have stronger prose skills than those not in the labor force.

Similar patterns occur on the document and quantitative scales, although here the gaps between the mean scores of the full-time and part-time employed are statistically significant and somewhat larger (8 and 10 points,

Table 1.6—Mean and median literacy proficiencies by labor force status: 1992

	Mean proficiency		
Labor force status	**Prose**	**Document**	**Quantitative**
Employed full time	288 (0.9)	284 (0.9)	290 (0.9)
Employed part time	284 (1.4)	277 (1.3)	280 (1.5)
Employed, not at work	285 (2.9)	278 (3.1)	282 (3.2)
Unemployed	260 (2.1)	257 (1.7)	256 (1.8)
Out of labor force	246 (1.1)	237 (1.3)	241 (1.6)

	Median proficiency		
Labor force status	**Prose**	**Document**	**Quantitative**
Employed full time	295	291	297
Employed part time	290	282	286
Employed, not at work	292	283	289
Unemployed	264	262	261
Out of labor force	252	244	251

	Percentile ranking		
Labor force status	**Prose**	**Document**	**Quantitative**
Employed full time	60	61	61
Employed part time	57	55	54
Employed, not at work	58	56	55
Unemployed	40	42	38
Out of labor force	33	32	33

Notes: Numbers in parentheses are standard errors.

SOURCE: U.S. Department of Education, National Center for Education Statistics, National Adult Literacy Survey, 1992.

respectively) than those found on the prose scale. Once again, the mean document and quantitative scores of unemployed adults are about half a standard deviation below those of adults employed full time, and the scores of adults not active in the labor force are nearly .8 standard deviations below those of the full-time employed.

Similar to the findings for the entire labor force, the median literacy scores of each labor force subgroup are somewhat higher than the mean scores, with the absolute size of these differences typically ranging from 5 to 6 points. The differences in median scores among the labor force subgroups are nearly identical in magnitude to the differences in mean scores.

The percentile ranking of the median prose score of the unemployed is only the 40th percentile, which is 20 percentage points below the ranking of the full-time employed. Similar-sized differences are found on the document and quantitative literacy scales.

To provide a better understanding of the range of abilities possessed by each subgroup, the authors also analyzed the percentage distribution of respondents in each labor force subgroup across the five levels on each literacy scale (Table 1.7). Thirteen percent of the full-time employed had prose scores in the Level 1 range, approximately one-quarter scored in Level 2, 36 percent were in Level 3, and 23 percent performed in Level 4. Only 5 percent of full-time workers attained the highest level of prose literacy.

While some members of the unemployed and out of labor force cohorts scored in each literacy level, many performed in the two lowest levels. On the

Table 1.7—Distribution of adults across the literacy levels, by labor force status: 1992

Literacy scale/	Percent in level...				
labor force status	1	2	3	4	5
Prose					
Employed full time	13	24	36	23	5
Employed part time	14	26	37	20	4
Employed, not at work	15	24	37	21	4
Unemployed	24	35	29	11	1
Out of labor force	35	30	25	9	1
Document					
Employed full time	14	26	35	21	4
Employed part time	17	29	35	17	3
Employed, not at work	16	30	34	18	3
Unemployed	26	34	29	10	1
Out of labor force	39	31	22	7	1
Quantitative					
Employed full time	13	23	35	23	6
Employed part time	15	27	36	18	4
Employed, not at work	17	24	36	19	4
Unemployed	28	32	28	10	2
Out of labor force	37	27	24	10	2

SOURCE: U.S. Department of Education, National Center for Education Statistics, National Adult Literacy Survey, 1992.

prose scale, nearly 60 percent of unemployed respondents scored in the range for Level 1 or 2, while just 12 percent reached the two highest levels. Among adults not in the labor force, about two-thirds scored in Level 1 or 2, and only one in 10 scored in Level 4 or 5. Similar patterns prevailed on the document and quantitative scales. The fact that so many unemployed adults demonstrate limited proficiencies suggests the existence of structural impediments to their reabsorption into the ranks of the employed at the time of the survey, particularly in a slack labor market environment with little to no job growth in many less skilled occupations.[7]

Labor Force Behavior and Employment Status

To illustrate the relationships between adults' literacy proficiencies and their labor market behavior at the time of the survey, several labor force participation and employment status measures were calculated for adults in each literacy level:

- The labor force participation rate — the percentage of adults in each literacy level who were employed, on layoff, or looking for work at the time of the survey.
- The unemployment rate — the percentage of the civilian labor force in each literacy level who were unemployed at the time of the survey. (Persons not in the labor force are excluded from both the numerator and denominator of the formula used to calculate this rate.)
- The employment/population ratio — the percentage of adults in each literacy level who were employed either full time or part time at the time of the survey.
- The full-time employment rate — the percentage of the employed in each literacy level who were working for 35 or more hours each week at the time of the survey.[8]
- The full-time employment/population ratio — the percentage of adults in each literacy level who were working for 35 or more hours a week at the time of the survey.

At the time the National Adult Literacy Survey was administered, 69 percent of the civilian adults in this country age 16 and older were in the labor force (Table 1.8). On each literacy scale, the labor force participation rate rises continuously and significantly across the proficiency levels. On the document scale, for example, just 48 percent of the adults in Level 1 were employed, on layoff, or looking for work, compared with 78 percent of those in Level 3 and 91 percent of those in Level 5 (Figure 1.2). Similar patterns are evident on the other two literacy scales. The differences in participation rates between the lowest and highest levels on each scale are sizable, ranging from 38 to 42 percentage points.

Literacy proficiencies might be expected to have a positive influence on adults' decisions to participate in the civilian labor force for several reasons. First, the higher one's literacy level, the higher the expected wages from employment. Higher market wages should induce some adults, particularly women, to substitute more time in the paid labor market for leisure time or time spent producing home output.[9] Second, adults with higher literacy levels should be more employable and less likely to encounter involuntary unemployment when they do enter the labor market in search of work. Less skilled adults, who face more limited job prospects, may become discouraged from active labor force participation. Third, stronger literacy skills may facilitate the ability of workers displaced from their jobs to become reemployed and to avoid lengthy spells of joblessness that often lead to premature labor force withdrawal. Studies of the post-displacement labor market experiences of United States workers age 20 to 62 reveal that the better educated, ceteris paribus, encounter fewer weeks of joblessness, have higher rates of full-time

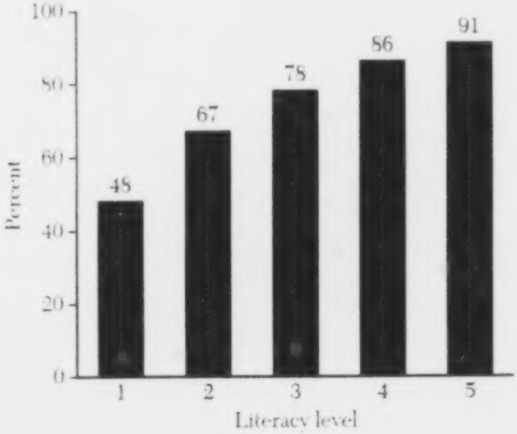
Table 1.8—Labor force participation rates by literacy level: 1992

	Percent employed, on layoff, or seeking work		
Level	**Prose**	**Document**	**Quantitative**
All	69 (0.4)	69 (0.4)	69 (0.4)
Level 1	49 (1.0)	48 (1.0)	48 (1.1)
Level 2	65 (0.8)	67 (1.0)	68 (0.8)
Level 3	77 (0.6)	78 (0.6)	76 (0.6)
Level 4	83 (0.7)	86 (0.7)	84 (0.8)
Level 5	91 (1.3)	91 (1.6)	85 (1.4)

Notes: Numbers in parentheses are standard errors.

SOURCE: U.S. Department of Education, National Center for Education Statistics, National Adult Literacy Survey, 1992.

Figure 1.2—Labor force participation rates by document literacy level: 1992



SOURCE: U.S. Department of Education, National Center for Education Statistics, National Adult Literacy Survey, 1992.

employment, and are more likely to avoid large weekly earnings declines upon becoming reemployed.[10] Finally, workers with stronger literacy skills are more likely to gain access to higher status, higher prestige occupations that increase the utility derived from work, and thus they are more likely to commit themselves to the labor market.

The extraordinarily large differences in labor force participation rates between adults with the lowest and highest literacy proficiencies are attributable in part to the high fraction of older adults who performed poorly in the assessment. Approximately one-third of the adults in Level 1 on each scale were age 65 or older; in contrast, only 2 to 7 percent of the adults who performed in Level 5 were in this age group.[11] At the time of the National Adult Literacy Survey, only 16 percent of the older adult population (age 65 and older) was actively participating in the labor force. Removing this population from the analysis of labor force participation would diminish the differences between the participation rates of the least and most proficient, but sizable differences would still remain (a gap of 41 percentage points on the prose scale, for example).

In general, the ability of labor force participants to avoid unemployment was also strongly associated with their literacy levels (Table 1.9, Figure 1.3). Approximately 10 percent of adults in the labor force were categorized as "unemployed" at the time of the survey. On the quantitative scale, unemployment rates ranged from nearly 20 percent for those in Level 1 to 9 percent for those in Level 3 and only 3 percent for those in Level 5, a relative difference of seven to one between the bottom and top levels. All of the differences in unemployment rates across the levels on the quantitative scale were statistically significant. On the prose and document scales, the unemployment rates of labor force participants in Level 1 were approximately four times higher than those of participants in Level 5.

The overall employment/population ratio for civilian adults was 62.3 percent, indicating that about 62 of every 100 adults were working at the time of the survey (Table 1.10). On each literacy scale, employment rates varied directly, strongly, and significantly with adults' proficiency levels.[12] On the prose scale, the proportion of adults who were working ranged from 41 percent of those in Level 1 to 71 percent of those in Level 3 and a maximum of 87 percent of those in Level 5. The patterns were nearly identical for the other two literacy scales. Adults who scored in the highest level of prose, document, and quantitative literacy were more than twice as likely as those who scored in the lowest level to be holding a job.

Three-quarters (76 percent) of the employed adults were working full time at the time of the survey (Table 1.11). The share of the employed who

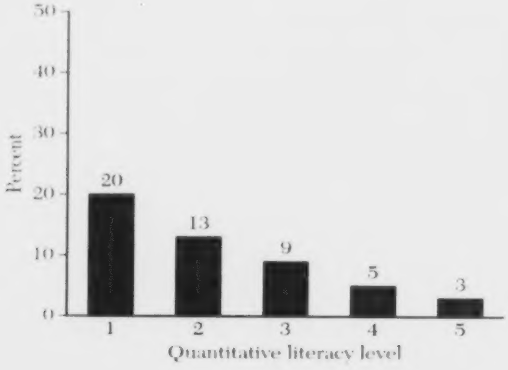
Table 1.9—Unemployment rates by literacy level: 1992

	Percent of labor force participants who were unemployed		
Level	**Prose**	**Document**	**Quantitative**
All	10 (0.3)	10 (0.3)	10 (0.3)
Level 1	17 (1.1)	17 (1.0)	20 (1.1)
Level 2	15 (0.8)	13 (0.7)	13 (0.8)
Level 3	8 (0.4)	8 (0.5)	9 (0.5)
Level 4	6 (0.4)	5 (0.5)	5 (0.3)
Level 5	4 (0.8)	5 (1.1)	3 (0.7)

Notes: Numbers in parentheses are standard errors

SOURCE: U.S. Department of Education, National Center for Education Statistics, National Adult Literacy Survey, 1992.

Figure 1.3—Unemployment rates by quantitative literacy level: 1992



SOURCE: U.S. Department of Education, National Center for Education Statistics, National Adult Literacy Survey, 1992.

Table 1.10—Employment/population ratios by literacy level: 1992

	Percent employed		
Level	**Prose**	**Document**	**Quantitative**
All	62 (0.4)	62 (0.4)	62 (0.4)
Level 1	41 (1.0)	39 (0.9)	38 (1.0)
Level 2	55 (0.8)	58 (0.9)	57 (0.8)
Level 3	71 (0.6)	72 (0.6)	70 (0.6)
Level 4	78 (0.8)	82 (0.8)	80 (0.8)
Level 5	87 (1.3)	86 (2.0)	83 (1.5)

Notes: Numbers in parentheses are standard errors.

SOURCE: U.S. Department of Education, National Center for Education Statistics, National Adult Literacy Survey, 1992.

held full-time jobs tends to rise moderately across the literacy levels, but the differences across the levels are not significant in most cases until we reach the top two proficiency levels. On the document scale, for example, 73 percent of the employees in Level 1 were working full time, compared with 75 percent of those in Level 3 and 82 percent of those in Level 5. On each literacy scale, the most proficient employees were the most likely to be working full time.

The findings on employment/population ratios and on the percentages of employed adults working full time can be combined to estimate full-time employment/population ratios. Forty-seven percent of the National Adult Literacy Survey respondents were employed full time when the survey was conducted (Table 1.12). These full-time employment/population ratios vary widely across the literacy levels, rising steadily and significantly from the lowest level to the highest. On the quantitative scale, for example, only 27 percent of those in Level 1 were working full time, compared with 52 percent of those in Level 3 and 70 percent of those in Level 5. In other words, the most literate adults were approximately 2.5 times more likely than the least literate to be working full time.

Table 1.11—Percentage of employed adults working full time during the reference week by literacy level: 1992

	Percent of employed adults working full time		
Level	**Prose**	**Document**	**Quantitative**
All	76 (0.5)	76 (0.5)	76 (0.5)
Level 1	75 (1.3)	73 (1.3)	72 (1.4)
Level 2	74 (1.1)	73 (1.0)	72 (1.0)
Level 3	75 (0.6)	75 (0.6)	75 (0.7)
Level 4	77 (0.7)	80 (1.0)	80 (0.9)
Level 5	82 (1.5)	82 (2.0)	85 (1.5)

Notes: Numbers in parentheses are standard errors.

SOURCE: U.S. Department of Education, National Center for Education Statistics, National Adult Literacy Survey, 1992.

Table 1.12—Full-time employment/population ratios by literacy level: 1992

Level	Percent employed full time Prose	 Document	 Quantitative
All	47 (0.5)	47 (0.5)	47 (0.5)
Level 1	30 (1.0)	29 (1.0)	27 (1.0)
Level 2	41 (0.9)	43 (0.9)	43 (0.9)
Level 3	54 (0.7)	54 (0.7)	52 (0.7)
Level 4	60 (0.9)	65 (1.0)	64 (0.9)
Level 5	71 (1.7)	70 (2.5)	70 (1.7)

Notes: Numbers in parentheses are standard errors.

SOURCE: U.S. Department of Education, National Center for Education Statistics, National Adult Literacy Survey, 1992.

Literacy Proficiencies and Weeks Worked

Respondents were asked how many weeks and hours they had worked (for pay) during the 12 months preceding the survey. The mean prose, document, and quantitative scores of individuals who had worked various numbers of weeks are displayed in Table 1.13. Mean scores rise continuously and substantially by the number of weeks worked in the prior year. On the prose scale, for example, the mean score of those who had not worked for pay in the past 12 months is only 240. The mean scores are considerably higher for those who had been employed for six months or less (274) and higher still for those employed 40 or more weeks (289). All the differences between these three employment groups are statistically significant at either the .05 or .01 level.[13] The differences in mean prose, document, and quantitative proficiencies between those who were employed 40 or more weeks and those who had not worked are quite sizable, ranging from 50 to 55 points, or .8 to .9 standard deviations.

It is also informative to examine the percentages of adults in each literacy level who had worked various numbers of weeks in the past year (Table 1.14). Across the scales, 52 to 54 percent of adults who scored in the Level 1 range had not worked for pay in the 12 months before the survey, and only 30 to 33 percent had worked 40 or more weeks. Among those with scores in Level 3, about one-fifth had not worked in the past year, while 61 to 62 percent had worked 40 weeks or more . In contrast, 90 to 95 percent of the adults in Level 5 had worked in the past year, and 74 to 79 percent had held a job for 40 weeks or longer.

Table 1.13—Mean literacy proficiencies by weeks worked in the past 12 months: 1992

Weeks worked	Mean proficiency Prose	Document	Quantitative
40 or more	289 (0.8)	285 (0.8)	290 (0.8)
27 to 39	281 (2.0)	277 (2.3)	282 (2.0)
1 to 26	274 (1.8)	271 (1.7)	271 (1.6)
None	240 (1.1)	231 (1.3)	235 (1.6)

Notes: Numbers in parentheses are standard errors.

SOURCE: U.S. Department of Education, National Center for Education Statistics, National Adult Literacy Survey, 1992.

Table 1.14—Weeks worked in the past 12 months by literacy level: 1992

Literacy scale /level	Percent who worked each number of weeks 40 or more	27 to 39	1 to 26	None
Prose				
Level 1	33	4	11	52
Level 2	47	6	13	35
Level 3	62	6	13	20
Level 4	69	6	12	13
Level 5	79	8	8	5
Document				
Level 1	32	4	10	54
Level 2	50	6	12	32
Level 3	62	6	14	18
Level 4	73	7	11	10
Level 5	78	7	10	6
Quantitative				
Level 1	30	4	11	54
Level 2	49	6	14	31
Level 3	61	6	12	21
Level 4	71	6	11	12
Level 5	74	7	10	10

SOURCE: U.S. Department of Education, National Center for Education Statistics, National Adult Literacy Survey, 1992.

Clearly, stronger literacy proficiencies are not only associated with more active labor force attachment at a given point in time, but also increase the extent of one's attachment over time. The least literate members of the adult population tend to remain on the margins of the labor market. Far fewer participate in the labor market. Many are unemployed, and those who are employed are less likely to be employed full time.

Endnotes

1. See: Ray Marshall and Marc Tucker, *Thinking for a Living*, especially pp. 65-67, 79-81.

2. See: James Fallows, "Gradgrind's Heirs," *Atlantic Monthly*, March 1987, p. 19; James Fallows, *More Like Us*, Houghton Mifflin, Boston, 1989.

3. For a more detailed review of the nature of the literacy tasks associated with the difficulty levels on each literacy scale, see: Irwin S. Kirsch, Ann Jungeblut, Lynn Jenkins, and Andrew Kolstad, *Adult Literacy in America . . . .* pp. 69-103.

4. For a review of findings from the NAEP assessments, see: Ina V.S. Mullis, John A. Dossey, Jay R. Campbell, Claudia A. Gentile, Christine O'Sullivan, and Andrew S. Latham, *Trends in Academic Progress*. For a review of the 1980 High School and Beyond Survey, see: (i) Samuel S. Peng, William B. Fetters, Andrew J. Kolstad, *High School and Beyond: A National Longitudinal Study for the 1980s, A Capsule Description of High School Seniors*, U.S. Department of Education, Washington, D.C., 1981; (ii) National Center for Education Statistics, *High School and Beyond, A National Longitudinal Study for the 1980s, Two Years of High School: The Status of 1980 Sophomores in 1982*, U.S. Government Printing Office, Washington, D.C., 1984.

5. The difference between the mean prose scores of the full- and part-time employed was not significant at the .05 level.

6. Standard deviations measure the spread around the mean and provide an approximation of how much individual cases differ from the average. The standard deviation of prose scores for the full-time employed was equal to 61.5 points. For the document and quantitative scales, the standard deviations were equal to 61 and 63 points, respectively.

7. For the first eight months of 1992, when the National Adult Literacy Survey was conducted, the monthly average national unemployment rate (seasonally adjusted) was 7.4 percent. Between 1989 and 1992, a time period including the recession of 1990-91, the U.S. economy generated only 256,000 net new jobs for civilian working-age adults, a .2 percent increase. The number

of blue-collar jobs (skilled, semiskilled, and unskilled) actually declined by 5 to 6 percent and the number of lower level sales jobs fell by about half a percent. See: U.S. Bureau of Labor Statistics, *Employment and Earnings*, January 1990, September 1992, January 1993, U.S. Government Printing Office, Washington, D.C.

8. Adults employed but not at work during the reference week are included in the denominator of this ratio but not the numerator. Without information on their "usual" hours of work, their status (full or part time) is unknown.

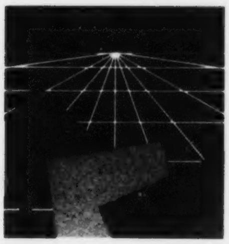
9. For a review of economic theories of labor supply and time allocation, see: (i) Mark R. Killingsworth, *Labor Supply*, Cambridge University Press, Cambridge, 1983; (ii) Gary S. Becker, "A Theory of the Allocation of Time," in *The Economic Approach to Human Behavior*, The University of Chicago Press, Chicago, 1976.

10. See: Paul Swaim and Michael Podgursky, "Do More Educated Workers Fare Better Following Job Displacement?," *Monthly Labor Review*, August 1989, pp. 43-46.

11. For a review of the distribution of adults in each age group across the levels on each literacy scale, see: Irwin S. Kirsch, Ann Jungeblut, Lynn Jenkins, and Andrew Kolstad, *Adult Literacy in America* . . ., pp. 119-121.

12. The two exceptions to this pattern are the differences between adults in Levels 4 and 5 on the document and quantitative scales. In these two cases, the differences are not quite significant using the Bonferroni adjustment.

13. On both the prose and document scales, the mean proficiency scores of adults working 27 to 39 weeks were not significantly higher than those of individuals working only 1 to 26 weeks.



CHAPTER TWO

The Literacy Proficiencies of Key Demographic, Socioeconomic, and Regional Subgroups of the Labor Force

While the previous chapter examined the literacy skills of the nation's entire civilian labor force and various labor force subgroups, this chapter explores the proficiencies of key demographic, socioeconomic, and geographic subgroups of the labor force. Performance data are provided for populations defined by sex, age, race/ethnicity, educational attainment, economic status, region, and country of birth — populations of primary interest to educators, human resource policymakers, program administrators, and labor market analysts. Their mean proficiencies on each literacy scale and the distribution of the full-time employed across the levels on each scale are examined.

Literacy Proficiencies of Men and Women

In all three areas of literacy assessed in the survey, the mean proficiencies of men and women employed full-time are quite similar (Table 2.1), with each group having small advantages on one or more of the scales. On the prose scale, the mean score for women (292) is 7 points higher than that for men (285). Although full-time employed women also appear to outperform men on the document portion of the assessment, the 3-point difference is not large enough to be statistically significant at the .05 level. On the quantitative scale, the mean score of men employed full time is 4 points higher than that of women, a statistically significant difference at the .05 level.

These sex differences in mean literacy proficiencies can be understood more fully by examining the distribution of full-time employed men and women across the levels on each literacy scale (Table 2.2). On the prose scale, women were less likely than men to perform in the lowest literacy level (10 percent compared with 15 percent). The two groups were equally likely to score in Level 4 or 5 on this scale, however. In the area of document literacy, women again were less likely than men to score in Level 1, but they were no more likely than men to perform in the two highest levels. On the quantitative scale, male full-time employees had significantly higher mean proficiencies

Table 2.1—Mean literacy proficiencies of labor force subgroups, by sex: 1992

	Mean proficiency			
Literacy scale/ sex	Employed full time	Employed part time	Unemployed	Out of labor force
Prose				
Male	285 (1.2)	271 (2.7)	257 (2.4)	240 (2.2)
Female	292 (1.0)	292 (1.6)	263 (3.2)	249 (1.2)
Document				
Male	283 (1.2)	267 (2.5)	256 (2.4)	235 (2.3)
Female	286 (1.0)	283 (1.6)	258 (2.4)	239 (1.5)
Quantitative				
Male	292 (1.2)	273 (2.8)	257 (2.4)	245 (3.4)
Female	288 (1.1)	284 (1.7)	254 (2.7)	240 (1.6)

Note: Numbers in parentheses are standard errors.

SOURCE: U.S. Department of Education, National Center for Education Statistics, National Adult Literacy Survey, 1992.

Table 2.2—Distribution of the full-time employed across the literacy levels, by sex: 1992

Literacy scale/	Percent in level...				
sex	1	2	3	4	5
Prose					
Male	15 (0.7)	24 (0,9)	34 (1.4)	22 (0.9)	5 (0.5)
Female	10 (0.6)	24 (0.8)	38 (1.1)	23 (1.1)	5 (0.4)
Document					
Male	15 (0.8)	24 (0.6)	34 (1.1)	22 (1.0)	4 (0.4)
Female	12 (0.9)	27 (0.9)	37 (1.0)	20 (0.9)	4 (0.4)
Quantitative					
Male	14 (0.7)	21 (0.8)	34 (0.9)	25 (0.8)	7 (0.5)
Female	12 (0.8)	25 (1.4)	38 (1.8)	21 (1.0)	4 (0.5)

Note: Numbers in parentheses are standard errors.

SOURCE: U.S. Department of Education, National Center for Education Statistics, National Adult Literacy Survey, 1992.

than their female counterparts, and they were significantly more likely to perform in Level 4 (25 percent compared with 21 percent) or Level 5 (7 percent compared with 4 percent).

Women who were working part time outperformed their male counterparts on all three literacy scales, with the size of these differences ranging from 11 points on the quantitative scale to 21 points on the prose scale. Each of these differences was statistically significant (.01 level).

Interestingly, on each scale, the mean literacy proficiencies of men employed full time were significantly higher than those of men employed part time, but these differences did not typically exist among employed women. Only the difference in mean quantitative scores between female part-time and full-time employees was statistically significant. These divergent findings for men and women may be attributable in part to differences between the two groups in reasons for working part time. In 1992, slightly more than three-quarters of the women who were working part time were doing so voluntarily. In contrast, 40 percent of the males working part time were doing so because they could not find a full-time job.[1] Stated differently, male part-time employees were more likely than their female counterparts to be underemployed. Males with limited proficiency may be at greater risk of underemployment than their more skilled peers, but the National Adult Literacy Survey data do not provide direct evidence to test this hypothesis.

Combined with other recent findings on educational attainment and college enrollment gains among women, the results of the National Adult Literacy Survey call into question the appropriateness of labeling women as an "educationally disadvantaged" group, as was done in the widely cited Workforce 2000 report.[2] Females in the existing labor force may not, on average, have adequate skills for the desired high-productivity work performance that the nation must seek, but their proficiencies are no less adequate than those of their male counterparts.

Literacy Proficiencies of Adults in Various Age Groups

The mean literacy proficiencies of the full-time employed rise from the 16 to 24 age group to the 35 to 44 age group, then fall continuously across the remaining age groups (Table 2.3, Figure 2.1). This pattern for full-time workers closely mirrors that for the entire adult population.[3] The mean prose scores of adults employed full time rise from 280 for 16- to 24-year-olds to 297 for 35- to 44-year-olds, then remain about the same at 292 among adults age 45 to 54, then decline to 243 among older members of the full-time employed (age 65 and older). Nearly identical trends prevailed on the document and quantitative scales. On each scale, full-time employees in the 35 to 44 age group significantly outperformed members of each other age group, with the exception of the 45 to 54 age group. Only the difference between the mean document scores of 35- to 44-year-olds and 45- to 54-year-olds was large enough to be classified as statistically significant.

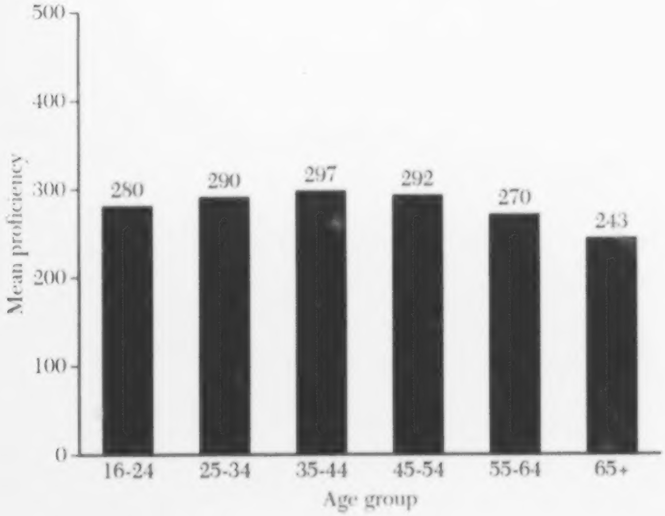
Table 2.3—Mean literacy proficiencies of labor force subgroups, by age group: 1992

	Mean proficiency			
Literacy scale/ age group	**Employed full time**	**Employed part time**	**Unemployed**	**Out of labor force**
Prose				
16 to 24	280 (2.1)	289 (1.8)	269 (2.7)	270 (2.2)
25 to 34	290 (1.7)	285 (3.5)	261 (3.5)	260 (3.0)
35 to 44	297 (1.7)	294 (3.1)	261 (3.7)	265 (4.0)
45 to 54	292 (1.8)	284 (4.5)	246 (6.6)	255 (3.2)
55 to 64	270 (2.5)	271 (4.4)	246 (7.6)	246 (3.1)
65 and older	243 (9.6)	259 (7.2)	——	227 (1.9)
Document				
16 to 24	281 (2.1)	288 (2.3)	269 (2.4)	272 (1.7)
25 to 34	290 (1.6)	280 (3.5)	259 (3.6)	257 (2.8)
35 to 44	293 (1.8)	285 (2.8)	256 (4.0)	258 (3.7)
45 to 54	283 (1.4)	271 (4.3)	240 (5.7)	247 (3.4)
55 to 64	261 (2.2)	257 (4.8)	239 (7.7)	235 (3.1)
65 and older	237 (7.8)	236 (6.0)	——	213 (2.2)
Quantitative				
16 to 24	279 (2.1)	285 (2.3)	262 (2.9)	267 (2.2)
25 to 34	292 (1.5)	279 (3.4)	257 (4.2)	254 (2.8)
35 to 44	299 (1.8)	288 (3.3)	258 (3.7)	257 (3.6)
45 to 54	294 (1.9)	279 (4.4)	244 (6.2)	251 (3.6)
55 to 64	274 (2.7)	270 (4.2)	250 (7.6)	246 (3.7)
65 and older	259(10.9)	264 (7.3)	——	222 (2.7)

Note: —— indicates that the number of cases is too small to provide reliable estimates. Numbers in parentheses are standard errors.

SOURCE: U.S. Department of Education, National Center for Education Statistics, National Adult Literacy Survey, 1992.

Figure 2.1—Mean prose literacy proficiencies of the full-time employed, by age group: 1992



SOURCE: U.S. Department of Education, National Center for Education Statistics, National Adult Literacy Survey, 1992.

These age differences in literacy skills among the full-time employed are also evident when one examines the percentages of those in each age group who scored in each level of prose, document, and quantitative literacy (Table 2.4). Full-time workers age 35 to 44 were less likely than workers in the other age cohorts to perform in the two lowest literacy levels. On the prose scale, for example, only 10 percent of the full-time employees age 35 to 44 scored in Level 1, compared with 12 to 19 percent of those in the other age groups; only 19 percent of 35- to 44-year-olds performed in Level 2, compared with 23 to 30 percent of those in the other groups. Conversely, 35- to 44-year-olds were more likely than those in the other age groups to score in Level 4.

The age differences in performance for the part-time employed vary in a number of substantive ways from those for the full-time employed. Among part-time workers, 35- to 44-year-olds appear to have the highest mean scores on the prose and quantitative scales, but the differences between their mean scores and those of the other age groups tend to be smaller than those among full-time workers and are frequently not statistically significant. For example, the mean prose score of 35- to 44-year-olds holding part-time jobs was 294,

Table 2.4—Distribution of the full-time employed across the literacy levels, by age group: 1992

Literacy scale/ age group	Percent in level... 1	2	3	4	5
Prose					
16 to 24	14 (1.4)	29 (2.2)	38 (2.5)	17 (1.9)	2 (0.4)
25 to 34	12 (1.0)	24 (1.2)	36 (1.2)	23 (1.3)	5 (0.5)
35 to 44	10 (0.8)	19 (1.1)	37 (1.6)	27 (1.1)	7 (0.6)
45 to 54	12 (1.0)	23 (1.6)	36 (2.0)	24 (1.3)	6 (0.7)
55 to 64	19 (1.6)	30 (1.7)	34 (1.8)	15 (1.6)	2 (0.5)
65 and older	——	——	——	——	——
Document					
16 to 24	13 (1.8)	29 (2.4)	39 (2.8)	18 (1.8)	2 (0.6)
25 to 34	12 (1.0)	24 (1.2)	37 (1.6)	24 (1.1)	5 (0.5)
35 to 44	12 (0.9)	22 (1.0)	36 (1.4)	25 (1.6)	5 (0.6)
45 to 54	14 (1.3)	27 (1.3)	35 (1.5)	21 (0.9)	4 (0.8)
55 to 64	24 (1.6)	34 (2.2)	31 (1.8)	10 (1.2)	1 (0.5)
65 and older	——	——	——	——	——
Quantitative					
16 to 24	14(1.6)	27 (2.4)	41 (2.4)	16 (1.8)	2 (0.7)
25 to 34	12 (0.8)	23 (1.0)	36 (1.3)	23 (0.9)	6 (0.8)
35 to 44	11 (0.9)	19 (1.3)	35 (1.3)	28 (1.1)	8 (0.6)
45 to 54	13 (1.3)	21 (1.4)	35 (1.4)	25 (1.8)	7 (0.9)
55 to 64	18 (1.5)	30 (2.8)	32 (1.6)	2 (3.0)	1 (0.9)
65 and older	——	——	——	——	——

Note: —— indicates that the number of cases is too small to provide reliable estimates. Numbers in parentheses are standard errors.

SOURCE: U.S. Department of Education, National Center for Education Statistics, National Adult Literacy Survey, 1992.

only 5 points above the mean score of 16- to 24-year-olds and 9 points above the mean score of 25- to 34-year-olds. Neither of these differences is large enough to be judged statistically significant at the .05 level. Among adults age 16 to 24, the mean prose and document proficiencies of part-time workers actually exceed those of full-time workers by 6 to 9 points.[4] Many young adults employed part time are enrolled in high school or college, and their proficiencies substantially exceed those of young employed high-school dropouts and of high-school graduates who are not attending college.

In each age group and on each literacy scale, the unemployed performed significantly worse than the full-time employed. The mean scores of unemployed individuals varied across the age groups, with those age 45 and older receiving the lowest scores. Mean prose proficiencies, for example, range from highs of 269 among unemployed 16- to 24-year-olds to lows of 246 among unemployed 45- to 54-year-olds and 55- to 64-year-olds.

As a result of these patterns, the gaps in mean literacy scores between full-time employees and unemployed individuals differ across the age groups (Table 2.5). For example, while the mean prose score of full-time workers age 16 to 24 is just 11 points higher than that of their unemployed peers, the difference in scores between these two labor force groups increases to 29 points among 25- to 34-year-olds and to 46 points among 45- to 54-year-olds. The performance disparities are even larger on the quantitative scale. Among the youngest adults, for example, the mean quantitative score of full-time workers is 17 points higher than that of unemployed young adults; among 45- to 54-year-olds, the difference increases to 50 points.

In viewing these data, readers should note that unemployment rates in the United States vary considerably by age group. In 1992, annual average unemployment rates ranged from a high of 20 percent among teenagers to 11 percent among 20- to 24-year-olds, 6 percent among 35- to 44-year-olds, and 5 percent among 55- to 64-year-olds.[5] Accordingly, unemployed individuals represent a far smaller share of the older work force than the younger work force. Their substantially lower mean literacy scores suggest that the older unemployed are more likely to be facing structural unemployment problems, including difficulties in becoming reemployed upon dislocation from their jobs.[6]

Table 2.5—Differences in mean literacy proficiencies between the full-time employed and unemployed, by age group: 1992

	Difference in mean proficiency		
Age group	**Prose**	**Document**	**Quantitative**
16 to 24	+11	+12	+17
25 to 34	+29	+31	+35
35 to 44	+36	+37	+41
45 to 54	+46	+43	+50
55 to 64	+24	+22	+24

SOURCE: U.S. Department of Education, National Center for Education Statistics, National Adult Literacy Survey, 1992.

Literacy Proficiencies of Adults in Various Racial/Ethnic Groups

The National Adult Literacy Survey results for the entire adult population revealed substantial differences in mean literacy scores across the racial/ethnic groups. On each scale, White non-Hispanic adults had the highest mean proficiencies, followed by Asian/Pacific Islander/Other, Black, and Hispanic adults, with Hispanics of Mexican origin and of Central/South American origin typically faring the worst.[7] High percentages of adults in these latter two Hispanic groups (46 and 79 percent, respectively) were born outside the United States. Those who were born in this country outperformed their foreign-born counterparts by a considerable margin.

Racial/ethnic differences in literacy performance among the full-time and part-time employed conformed closely to those for the entire adult population (Table 2.6, Figure 2.2). Among adults working full time, mean scores were highest for White non-Hispanics, followed by Asian/Pacific Islanders, Blacks, and Hispanics, with Hispanics of Mexican origin scoring the lowest.

The differences in mean literacy proficiencies between employed White adults and those in each of the other racial/ethnic groups were quite large. For example, the mean prose score of White adults employed full time was 302, compared with 252 for Asian/Pacific Islanders and 250 for Blacks. These 50- to 52-point differences are equivalent to nearly .9 standard deviations on the White prose score distribution. The differences in mean scores between White and Hispanic full-time employees are even greater: approximately 60 points for Cubans, Central Americans, and Puerto Ricans, and 90 points for Mexicans. These differences are equal to 1 to 1.5 standard deviations.

The differences in mean literacy proficiencies among the full-time employed in the above racial/ethnic groups were echoed in the data on levels of proficiency. Just as White full-time workers had higher mean scores than Black or Hispanic workers, so too were they less likely to perform in the lowest levels on each scale and more likely to attain the highest levels (Table 2.7). On the quantitative scale, for example, just 7 percent of the White full-time employees scored in the Level 1 range and 20 percent scored in the Level 2 range. In contrast, Black and Hispanic full-time employees were far more likely to perform in Level 1 (35 and 42 percent, respectively) and Level 2 (37 and 25 percent, respectively). At the other end of the performance spectrum, 28 percent of White full-time employees reached Level 4 on the quantitative scale and 7 percent attained Level 5, compared with far smaller percentages of their Black and Hispanic counterparts.

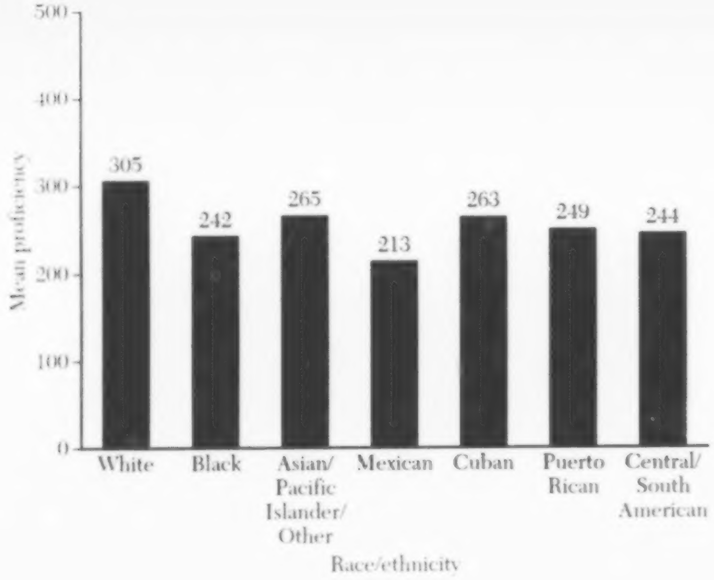
Table 2.6—Mean literacy proficiencies of labor force subgroups, by race/ethnicity: 1992

Literacy scale/ race/ethnicity	Mean proficiency			
	Employed full time	Employed part time	Unemployed	Out of labor force
Prose				
White	302 (1.0)	296 (1.7)	276 (3.0)	259 (1.1)
Black	250 (2.1)	242 (3.3)	237 (2.5)	216 (3.0)
Hispanic	226 (3.2)	228 (5.8)	225 (5.9)	189 (4.0)
Mexican	212 (5.0)	220 (7.2)	217 (8.6)	185 (4.6)
Cuban	241 (12.0)	——	——	165 (10.2)
Puerto Rican	243 (6.8)	——	——	189 (12.1)
Central/South American and others	244 (6.1)	244 (12.4)	236 (12.9)	206 (6.9)
Other	253 (6.5)	269 (8.4)	251 (10.3)	209 (7.7)
Document				
White	297 (1.0)	288 (1.6)	275 (2.6)	249 (1.4)
Black	244 (1.7)	235 (3.5)	230 (2.6)	210 (2.5)
Hispanic	227 (3.3)	225 (6.1)	223 (6.6)	184 (4.0)
Mexican	212 (5.1)	217 (7.6)	214 (9.7)	183 (5.1)
Cuban	244 (13.7)	——	——	161 (10.8)
Puerto Rican	246 (6.1)	——	——	178 (11.9)
Central/South American and others	247 (5.9)	237 (12.4)	233 (11.3)	194 (8.0)
Other	257 (5.6)	270 (8.2)	247 (9.9)	213 (7.3)
Quantitative				
White	305 (0.9)	292 (1.8)	276 (2.4)	257 (1.6)
Black	242 (2.2)	230 (3.3)	222 (2.6)	199 (3.2)
Hispanic	229 (3.5)	223 (7.0)	218 (7.1)	180 (4.2)
Mexican	213 (5.3)	216 (8.7)	211 (9.7)	183 (5.2)
Cuban	263 (16.7)	——	——	159 (9.0)
Puerto Rican	249 (6.0)	——	——	170 (13.9)
Central/South American and others	244 (6.2)	233 (12.2)	218 (13.0)	184 (10.0)
Other	265 (6.5)	275 (10.7)	245 (8.7)	219 (7.9)

Note: —— indicates that the number of cases is too small to provide reliable estimates. Numbers in parentheses are standard errors.

SOURCE: U.S. Department of Education, National Center for Education Statistics, National Adult Literacy Survey, 1992.

Figure 2.2—Mean quantitative literacy proficiencies of the full-time employed, by race/ethnicity: 1992



SOURCE: U.S. Department of Education, National Center for Education Statistics, National Adult Literacy Survey, 1992.

Racial/ethnic differences in literacy proficiency among the part-time employed are similar in most respects to those among the full-time employed, with one exception: The mean document and quantitative scores of Asian/Pacific Islanders employed part time were statistically identical to those of Whites.[8] This may reflect the greater representation of native-born Asians and of Asian students among the ranks of the part-time employed. The differences between the mean scores of White and Black part-time workers (53 to 62 points) and of White and Mexican part-time workers (71 to 76 points) are of similar magnitude to those for full-time employees.

Table 2.7—Distribution of the full-time employed across the literacy levels, by race/ethnicity: 1992

Literacy scale/ race/ethnicity	Percent in level... 1	 2	 3	 4	 5
Prose					
White	7 (0.6)	22 (0.7)	39 (1.1)	27 (0.8)	6 (0.4)
Black	29 (1.5)	37 (1.9)	27 (1.9)	6 (0.9)	1 (0.3)
Hispanic	44 (2.2)	26 (2.0)	22 (2.0)	8 (1.3)	1 (0.8)
Other	30 (4.7)	26 (4.9)	28 (6.4)	14 (3.2)	2 (1.6)
Document					
White	8 (0.7)	24 (0.7)	39 (0.9)	25 (0.8)	5 (0.4)
Black	33 (1.5)	39 (2.0)	23 (1.6)	5 (0.7)	0 (0.2)
Hispanic	42 (2.2)	27 (1.9)	22 (1.9)	7 (1.5)	1 (0.6)
Other	28 (4.3)	27 (4.1)	30 (4.4)	13 (3.8)	2 (1.3)
Quantitative					
White	7 (0.6)	20 (0.9)	38 (1.2)	28 (0.7)	7 (0.4)
Black	35 (2.1)	37 (2.4)	23 (2.0)	5 (0.6)	0 (0.2)
Hispanic	42 (1.9)	25 (2.4)	24 (2.7)	8 (2.0)	1 (0.4)
Other	25 (4.3)	24 (3.6)	31 (4.0)	16 (3.5)	4 (2.1)

Note: Numbers in parentheses are standard errors.

SOURCE: U.S. Department of Education, National Center for Education Statistics, National Adult Literacy Survey, 1992.

The unemployed members of most racial/ethnic groups, except Central/South Americans and Mexicans, have proficiencies well below those of their counterparts who were working full time. For each group, literacy proficiencies were weakest among adults not participating in the labor force. The results show that substantial segments of the nation's non-White population not actively participating in the work force have very limited literacy skills in each of the three dimensions of literacy assessed. Future efforts to bring more of these adults, especially those who are poor or near poor, into the labor market must address their substantive literacy deficits.

Literacy Proficiencies of Adults with Various Levels of Schooling

Given the importance of literacy proficiencies in influencing the amount of formal schooling that adults eventually complete, one would expect employed adults' mean proficiencies to vary systematically with their formal educational attainments.[9] The survey results for full-time and part-time employees by their years of formal schooling clearly bear this out (Table 2.8, Figure 2.3).

On each literacy scale, the mean scores of full-time employees increase continuously, substantially, and significantly with the level of education attained. Mean prose proficiencies, for example, were just 172 for those with only a primary school education, compared with 272 to 275 for those with a high-school diploma or GED certificate but no postsecondary schooling, 309 for those with a two-year degree, and 334 for those who completed at least a four-year degree. The 25-point difference in mean prose scores between two- and four-year degree holders was equivalent to .6 standard deviations on the prose distribution for four-year college graduates. The 59-point difference in mean scores between four-year degree recipients and high-school graduates was equal to nearly 1.4 standard deviations.[10] Nearly identical patterns are visible for the document and quantitative scales.

The substantial differences in literacy skills among full-time employees in various educational attainment subgroups can be seen even more vividly when one examines their distribution across the literacy levels. Nearly three-quarters of the full-time employed with only a primary school education (zero to eight years of schooling) performed in the lowest level of prose literacy, and less than 1 percent of them achieved Level 4 or 5 (Table 2.9). While only 13 percent of the full-time employees with a high-school diploma or a GED scored in Level 1 on this scale, relatively few (13 percent) attained the two highest levels; the vast majority (75 percent) scored in Level 2 or 3. On average, four-year college graduates performed the best on each scale; yet, only 11 to 17 percent of those graduates who were employed full time attained Level 5, while 9 percent or more scored in the two lowest levels.

The mean proficiencies of the part-time employed also increase continuously by level of formal schooling; however, the differences between these subgroups tend to be somewhat smaller than those for the full-time employed. For example, the mean scores of part-time employees who possess a bachelor's degree exceeded those of two-year degree holders by only 12 to 18 points (.3 to .4 standard deviations, versus .6 standard deviations for the full-time employed).

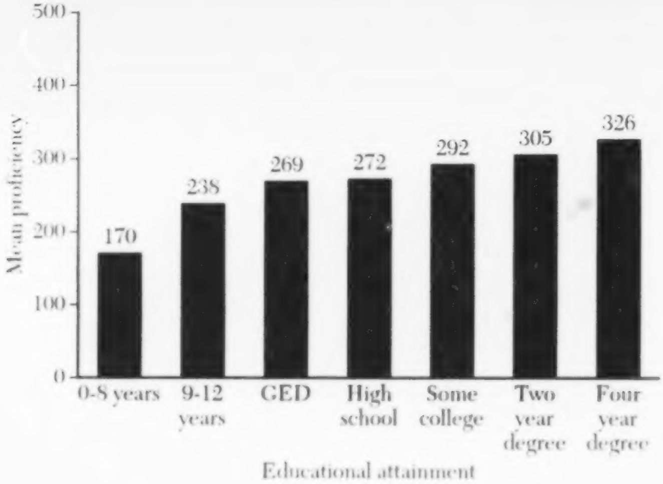
Table 2.8—Mean literacy proficiencies of labor force subgroups, by highest level of schooling attained: 1992

	Mean proficiency			
Literacy scale/ highest level of schooling	**Employed full time**	**Employed part time**	**Unemployed**	**Out of labor force**
Prose				
0 to 8 years	172 (4.7)	186 (5.5)	183 (8.2)	177 (3.7)
9 to 12 years	239 (2.4)	261 (2.9)	245 (2.7)	234 (1.5)
GED	272 (2.4)	274 (8.0)	267 (6.5)	259 (4.6)
High-school diploma	275 (1.4)	279 (3.1)	259 (2.8)	260 (1.7)
Some postsecondary	294 (1.2)	298 (3.0)	281 (3.9)	273 (2.6)
Two-year degree	309 (1.5)	317 (2.7)	302 (5.6)	293 (3.2)
Four-year degree or more	334 (1.1)	335 (2.8)	321 (4.3)	307 (2.6)
Document				
0 to 8 years	170 (4.0)	178 (5.2)	181 (7.2)	167 (3.2)
9 to 12 years	238 (2.7)	258 (3.1)	243 (2.8)	230 (2.0)
GED	269 (2.7)	270 (9.1)	263 (6.9)	258 (1.8)
High-school diploma	272 (1.5)	270 (2.3)	256 (3.3)	257 (1.8)
Some postsecondary	292 (1.2)	289 (2.6)	279 (2.6)	277 (3.1)
Two-year degree	305 (1.3)	310 (3.1)	296 (4.2)	289 (3.7)
Four-year degree or more	326 (0.9)	322 (2.9)	313 (5.2)	306 (3.4)
Quantitative				
0 to 8 years	175 (5.4)	186 (7.0)	176 (7.3)	164 (4.6)
9 to 12 years	240 (2.4)	257 (3.0)	237 (3.3)	230 (2.0)
GED	275 (3.0)	269 (8.1)	263 (6.7)	258 (5.5)
High-school diploma	278 (1.5)	275 (2.7)	256 (3.2)	257 (1.8)
Some postsecondary	298 (1.6)	295 (3.3)	282 (3.2)	277 (3.1)
Two-year degree	311 (1.7)	312 (3.1)	296 (4.4)	289 (3.7)
Four-year degree or more	334 (1.1)	328 (2.6)	318 (2.3)	306 (3.4)

Note: Numbers in parentheses are standard errors.

SOURCE: U.S. Department of Education, National Center for Education Statistics, National Adult Literacy Survey, 1992.

Figure 2.3—Mean document literacy proficiencies of the full-time employed, by educational attainment: 1992



SOURCE: U.S. Department of Education, National Center for Education Statistics, National Adult Literacy Survey, 1992.

The literacy skills of the unemployed also vary widely by educational attainment. These substantial differences prevail despite the existence of considerably higher unemployment rates among the less well educated. At the time of the assessment, unemployment rates ranged from nearly 20 percent among adults without a high-school diploma to 11 percent among high-school graduates with no postsecondary schooling, and to a low of 4 percent among those who had completed four or more years of college.

Table 2.9—Distribution of the full-time employed across the literacy levels, by highest level of schooling attained: 1992

Literacy scale/ highest level of schooling	Percent in level...				
	1	2	3	4	5
Prose					
0 to 8 years	73 (3.1)	21 (3.2)	6 (2.2)	0 (0.3)	0 (0.0)
9 to 12 years	35 (2.1)	40 (2.8)	22 (2.5)	4 (0.9)	0 (0.2)
High-school diploma or GED	13 (0.9)	35 (1.3)	40 (1.6)	12 (0.9)	1 (0.2)
Some postsecondary	5 (0.6)	22 (1.0)	47 (1.3)	24 (1.0)	3 (0.5)
Two-year degree	3 (0.9)	17 (2.3)	42 (4.3)	34 (3.4)	4 (1.2)
Four-year degree or more	2 (0.4)	8 (0.7)	30 (1.5)	46 (1.5)	15 (0.7)
Document					
0 to 8 years	78 (3.2)	17 (2.8)	5 (1.8)	0 (0.1)	0 (0.0)
9 to 12 years	36 (2.8)	40 (2.4)	21 (2.4)	3 (0.8)	0 (0.2)
High-school diploma or GED	15 (1.4)	36 (1.2)	38 (1.2)	11 (1.0)	1 (0.2)
Some postsecondary	6 (0.4)	25 (1.0)	44 (1.6)	23 (1.3)	3 (0.6)
Two-year degree	5 (1.5)	20 (2.1)	42 (3.5)	29 (3.8)	4 (1.1)
Four-year degree or more	2 (0.4)	10 (0.9)	35 (1.1)	42 (1.2)	11 (1.0)
Quantitative					
0 to 8 years	73 (3.6)	19 (3.4)	7 (2.2)	1 (1.0)	0 (0.0)
9 to 12 years	36 (2.2)	37 (3.2)	23 (2.2)	4 (1.5)	0 (0.3)
High-school diploma or GED	13 (1.0)	31 (1.7)	40 (1.7)	14 (0.9)	1 (0.3)
Some postsecondary	6 (0.6)	21 (1.4)	43 (2.0)	27 (1.4)	4 (0.8)
Two-year degree	4 (1.0)	16 (2.5)	43 (3.0)	32 (3.3)	6 (1.5)
Four-year degree or more	1 (0.4)	9 (0.8)	30 (1.4)	42 (1.2)	17 (1.0)

Note: Numbers in parentheses are standard errors.

SOURCE: U.S. Department of Education, National Center for Education Statistics, National Adult Literacy Survey, 1992.

Literacy Proficiencies of Adults by Poverty Status

Survey participants were asked to provide information on the number of persons living in their household and the amount of money income that had been received by all household members in the past 12 months. This information was used to determine whether participants lived in a poor or near poor household.[11]

Table 2.10 presents the mean scores of adults in each labor force group who were categorized as poor or near poor and those classified as neither poor nor near poor. On each literacy scale, full-time workers who were not poor outperformed those who were poor or near poor by a considerable margin. The differences in mean scores between the two groups ranged from 44 to 51 points, or approximately .8 to .9 standard deviations, across the scales. Large mean score differences (31 to 36 points) between the two groups also occur among part-time employees.

Table 2.10—Mean literacy proficiencies of labor force subgroups, by poverty status: 1992

	Mean proficiency			
Literacy scale/ poverty status	Employed full time	Employed part time	Unemployed	Out of labor force
Prose				
Poor or near poor	252 (3.6)	262 (4.8)	251 (3.5)	219 (2.9)
Neither poor nor near poor	299 (0.9)	298 (1.9)	278 (3.3)	268 (1.6)
Document				
Poor or near poor	250 (3.8)	257 (5.5)	247 (3.7)	211 (3.0)
Neither poor nor near poor	294 (0.9)	288 (1.7)	274 (3.2)	258 (1.8)
Quantitative				
Poor or near poor	252 (3.5)	258 (5.4)	243 (4.0)	208 (3.5)
Neither poor nor near poor	301 (0.8)	294 (1.7)	276 (3.0)	268 (1.8)

Note: Numbers in parentheses are standard errors.

SOURCE: U.S. Department of Education, National Center for Education Statistics, National Adult Literacy Survey, 1992.

Poor or near poor adults who were not in the labor force at the time of the survey had very limited literacy proficiencies (208 to 219 across the scales). Many poor adults in this group appear to have substantial literacy deficits that are likely to exacerbate the difficulties traditionally encountered in efforts to strengthen their labor market attachment and earnings potential.

The differences in mean literacy scores among full-time employees who were poor or near poor and those who were not poor are accompanied by striking differences in the percentages who performed in the various levels of literacy. As shown in Table 2.11, full-time workers who were poor or near poor by virtue of their income and household size were far more likely than those who were not poor to perform in Level 1 or 2 on each literacy scale. On the document scale, for example, 30 percent of the full-time employees who were poor or near poor scored in Level 1 and another 30 percent scored in Level 2, while just 12 percent attained Level 4 and just 1 percent reached the highest level. In contrast, only 10 percent of the full-time employees who were not poor performed in Level 1 on the document scale and 24 percent scored in Level 2, while 24 percent reached the fourth level and 5 percent attained the fifth.

Table 2.11—Distribution of the full-time employed across the literacy levels, by poverty status: 1992

Literacy scale/ poverty status	Percent in level...				
	1	2	3	4	5
Prose					
Poor or near poor	29 (2.4)	31 (2.7)	28 (2.4)	12 (2.0)	1 (0.6)
Neither poor nor near poor	9 (0.5)	21 (0.7)	38 (1.1)	26 (0.9)	6 (0.4)
Document					
Poor or near poor	30 (2.5)	30 (2.2)	28 (2.7)	12 (1.7)	1 (0.6)
Neither poor nor near poor	10 (0.5)	24 (0.8)	38 (0.8)	24 (0.7)	5 (0.4)
Quantitative					
Poor or near poor	30 (2.4)	28 (3.4)	29 (2.8)	12 (1.8)	1 (0.8)
Neither poor nor near poor	9 (0.5)	21 (0.9)	37 (1.1)	27 (0.7)	7 (0.4)

Note: Numbers in parentheses are standard errors.

SOURCE: U.S. Department of Education, National Center for Education Statistics, National Adult Literacy Survey, 1992.

Literacy Proficiencies of Adults Residing in Various Regions

The states in which survey respondents were residing at the time of the assessment were grouped into four geographic regions as defined by the U.S. Bureau of the Census: the Northeast, Midwest, South, and West.[12] The mean literacy scores of full-time workers in the Midwest were higher than those of their counterparts in the Northeast and the South, and the scores of full-time employees in the South were consistently lower than those in the other three regions (Table 2.12). The differences in mean scores between the full-time employed in the Midwest and South ranged from 13 to 15 points across the scales. Not all of the regional differences in mean proficiencies among the full-time employed were statistically significant. The mean proficiencies of the full-time employed in the Northeast and West were statistically identical on each literacy scale.

Table 2.12—Mean literacy proficiencies of labor force subgroups, by region: 1992

Literacy scale/ region	Mean proficiency			
	Employed full time	Employed part time	Unemployed	Out of labor force
Prose				
Northeast	287 (1.7)	287 (2.8)	258 (4.2)	241 (2.2)
Midwest	296 (1.7)	291 (2.8)	267 (3.5)	252 (2.3)
South	283 (2.0)	276 (3.1)	257 (3.7)	240 (3.1)
West	290 (2.3)	287 (3.9)	260 (4.0)	253 (2.9)
Document				
Northeast	285 (1.6)	278 (2.6)	257 (4.0)	231 (2.6)
Midwest	292 (1.8)	284 (2.7)	263 (3.9)	245 (2.7)
South	278 (2.0)	269 (3.2)	254 (3.3)	232 (2.9)
West	285 (2.2)	280 (3.9)	256 (3.9)	244 (2.5)
Quantitative				
Northeast	291 (1.6)	282 (2.9)	256 (3.7)	232 (3.2)
Midwest	299 (2.1)	288 (2.8)	261 (4.2)	252 (3.7)
South	284 (1.9)	271 (3.3)	252 (3.8)	236 (3.4)
West	291 (2.4)	283 (4.3)	256 (4.9)	251 (2.7)

Note: Numbers in parentheses are standard errors.

SOURCE: U.S. Department of Education, National Center for Education Statistics, National Adult Literacy Survey, 1992.

Although full-time workers in the Midwest had the highest mean scores across the literacy scales, they were not significantly more likely to perform in Level 4 or 5 on any scale than their counterparts in the Northeast or West (Table 2.13). The Midwest's advantage in mean scores was primarily attributable to its sharply lower percentages of full-time workers in Level 1. On the prose and quantitative scales, only 8 percent of the full-time employed in the Midwest had proficiencies in the Level 1 range, in contrast with 13 to 14 percent of full-time workers in the Northeast and West and 16 percent of those in the South. In part, the lower percentage of Midwest workers with Level 1 proficiencies reflects this region's lower share of immigrant workers. Traditionally, the Northeastern seaboard and the West have been home to a higher than average proportion of the nation's foreign-born population.

Table 2.13—Distribution of the full-time employed across the literacy levels, by region: 1992

Literacy scale/	Percent in level...				
region	1	2	3	4	5
Prose					
Northeast	13 (1.0)	24 (1.6)	35 (1.2)	23 (1.2)	4 (0.6)
Midwest	8 (0.6)	24 (1.2)	40 (1.8)	24 (1.3)	4 (0.5)
South	16 (1.2)	26 (1.1)	34 (1.3)	20 (1.3)	5 (0.5)
West	14 (1.7)	20 (1.5)	34 (1.7)	26 (1.6)	6 (0.7)
Document					
Northeast	14 (0.8)	25 (1.1)	37 (1.9)	20 (1.9)	4 (0.6)
Midwest	9 (0.8)	27 (1.5)	39 (2.0)	22 (1.4)	4 (0.7)
South	17 (1.6)	28 (1.5)	33 (1.2)	19 (1.0)	4 (0.5)
West	15 (1.4)	22 (1.5)	35 (1.3)	24 (1.7)	5 (0.8)
Quantitative					
Northeast	13 (0.9)	22 (1.1)	37 (2.0)	23 (1.8)	6 (0.5)
Midwest	8 (0.9)	22 (2.1)	38 (1.8)	26 (1.5)	6 (0.6)
South	16 (1.2)	25 (1.2)	33 (1.8)	20 (0.9)	6 (0.6)
West	14 (1.2)	19 (1.3)	35 (1.5)	25 (1.5)	7 (0.8)

Note: Numbers in parentheses are standard errors.

SOURCE: U.S. Department of Education, National Center for Education Statistics, National Adult Literacy Survey, 1992.

Literacy Proficiencies of Native- and Foreign-born Adults

The National Adult Literacy Survey collected information on respondents' country of birth and asked foreign-born individuals to indicate the length of time they had resided in the United States. In the entire adult population, the mean proficiencies of the native born exceeded those of the foreign born by 61 to 67 points on each literacy scale, a difference of more than one full standard deviation.[13]

In recent years, growing concern has been expressed in the United States about the skills of recent immigrants. Some labor market analysts have argued that recent immigrants are disproportionately unskilled and are poorly matched to the nation's current and projected employment requirements.[14] Studies have concluded that immigrants of the mid- to late 1970s were less skilled and productive than earlier immigrants and were faring considerably less well in terms of employment, wages, and potential lifetime earnings.[15]

To assess the literacy proficiencies of recent and earlier cohorts of employed immigrants in this country, the authors examined the mean prose, document, and quantitative scores of three groups:

- Native-born persons age 16 to 65 who had worked at some point in the 12 months before the survey

- Foreign-born persons age 16 to 65 who had lived in the United States for 10 years or less and had worked at some point in the 12 months before the survey

- Foreign-born persons age 16 to 65 who had lived in the United States for more than 10 years and had worked at some point in the 12 months before the survey

According to other studies, foreign-born adults who had lived in this country for 10 years or less were younger, on average, than both native-born adults and immigrants with more than 10 years of residency. Seventy-one percent of the more recent immigrants were younger than age 35, versus only 46 percent of native-born adults and 39 percent of the immigrants who had lived in this country for more than a decade.

According to National Adult Literacy Survey data, approximately one-third of the more recent immigrants had completed less than 12 years of schooling either in their native country or in the United States. While this proportion is twice as high as that of the native born, it is smaller than that of the foreign born who had lived in this country for more than a decade. The more recent immigrants (19 percent) were as likely as earlier immigrants and native-born individuals to have completed four or more years of college. Not surprisingly, however, they were considerably more likely than earlier immigrants to report themselves as not speaking English well (45 percent versus 25 percent).

Foreign-born employees who had lived in this country for 10 years or less had mean prose, document, and quantitative scores of approximately 200 on each literacy scale. Their proficiencies are considerably lower (82 to 89 points) than those of native-born employees and about 25 to 30 points below those of foreign-born employees who had lived in this country for more than 10 years (Table 2.14). These literacy gaps are quite substantial, ranging from 1.5 to 1.8 standard deviations on the native-born score distribution. On each literacy scale, the mean scores of foreign-born workers with more than a decade of residency in this country were 55 to 61 points, or one full standard deviation, below those of native-born employees. Thus, while foreign-born employees tend to demonstrate lower literacy proficiencies than native-born employees, their proficiencies appear to increase the longer they reside in this country.

Table 2.14—Mean literacy proficiencies of the native- and foreign-born employed: 1992

	Mean proficiency		
Country of birth	**Prose**	**Document**	**Quantitative**
Native born	288 (55.4)	283 (55.8)	286 (59.3)
Foreign born, in U.S. 10 years or less	199 (78.8)	201 (82.5)	203 (85.3)
Foreign born, in U.S. more than 10 years	227 (82.2)	225 (77.9)	232 (82.6)

Note: Numbers in parentheses are standard deviations.

SOURCE: U.S. Department of Education, National Center for Education Statistics, National Adult Literacy Survey, 1992.

Endnotes

1. See: U.S. Bureau of Labor Statistics, *Employment and Earnings*, January 1993, "Table 33," p. 212.

2. See: William B. Johnston and Arnold E. Packer, op. cit.

3. See: Irwin S. Kirsch, Ann Jungeblut, Lynn Jenkins, and Andrew Kolstad, *Adult Literacy in America* . . ., pp. 30-31.

4. The 6-point difference in mean quantitative scores falls just short of statistical significance at the .05 level.

5. During calendar year 1992, the unemployment rate for adults age 65 and older was only 3.8 percent. The number of older unemployed adults in the sample was too small to estimate their proficiencies reliably. See: U.S. Bureau of Labor Statistics, *Employment and Earnings*, January 1993, "Table 3", p. 174.

6. For a review of the post-displacement labor market experiences and problems of older dislocated workers (age 55 and older) in the United States, See: Andrew M. Sum and Neal Fogg, "Labor Market Turbulence and the Older Worker," in *Turbulence in the American Workplace*, (Editors: Peter B. Doeringer, et al.), Oxford University Press, New York, 1991, pp. 64-101.

7. On each literacy scale, there were large differences in mean scores between Whites and Blacks (50 to 60 points) and between Whites and Hispanics (70 to 80 points for most subgroups). See: Irwin S. Kirsch, Ann Jungeblut, Lynn Jenkins and Andrew Kolstad, *Adult Literacy in America* . . ., pp. 32-34.

8. The numbers of part-time employed Hispanics of Cuban and Puerto Rican origin are too small to provide reliable proficiency estimates.

9. For a review of previous research on the influence of basic academic skills or achievement test scores on young adults' school enrollment behaviors and educational attainments, see: (i) John Tuma, Sonia Geis, and C. Dennis Carroll, *Educational Attainment of 1980 High School Sophomores by 1992*, National Center for Education Statistics, March 1995; (ii) Richard J. Herrnstein and Charles Murray, *The Bell Curve: Intelligence and Class Structure in American Life*, The Free Press, New York, 1994; (iii) Robert Taggart, Andrew Sum, and Gordon Berlin, *Cutting Through*, a report prepared for the Ford Foundation

Project on Social Welfare and the American Future, New York, 1987; (iv) Andrew M. Sum and Neal Fogg, "The Adolescent Poor and the Transition to Early Adulthood," in *Adolescence and Poverty*, Center for National Policy Press, pp. 37-110.

10. The standard deviation of prose scores for four-year college graduates (including those with some postgraduate education) is 43 points. The standard deviations are larger for those with fewer years of schooling: 48 points for high-school graduates/GED recipients, 55 points for those with nine to 12 years of schooling, and 69 points for those with only a primary school education.

11. The 1991 poverty income thresholds of the federal government were multiplied by 1.25 to determine the appropriate near-poor income cutoff point for households containing one to nine persons. The criteria were:

Household size	Near poor income threshold
1	$ 8,665
2	11,081
3	13,575
4	17,405
5	20,570
6	23,234
7	26,322
8	29,506
9	34,927

Source: U.S. Bureau of the Census, *Current Population Reports, Consumer Income, Series P-60*, No. 181, p. A-8.

The relationship of survey respondents to all other household members could not be determined using information collected in the background questionnaires; thus, in classifying the poor/near poor status of every respondent, each household was treated as a family household. The U.S. Census Bureau treats unrelated persons living on their own or in a household with others as separate families of one in determining their poverty status.

12. The following (Census) definitions of regions were used in the National Adult Literacy Survey:

Northeast: Maine, New Hampshire, Vermont, Massachusetts, Rhode Island, Connecticut, New York, New Jersey, Pennsylvania

Midwest: Ohio, Indiana, Illinois, Michigan, Wisconsin, Minnesota, Iowa, Missouri, North Dakota, South Dakota, Nebraska, Kansas

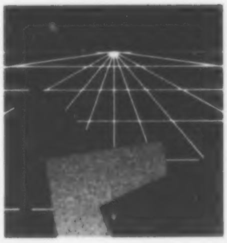
South: Delaware, Maryland, District of Columbia, Virginia, West Virginia, North Carolina, South Carolina, Georgia, Florida, Kentucky, Tennessee, Alabama, Mississippi, Arkansas, Louisiana, Oklahoma, Texas

West: Montana, Idaho, Wyoming, Colorado, New Mexico, Arizona, Utah, Nevada, Washington, Oregon, California, Alaska, Hawaii

13. See: Irwin S. Kirsch, Ann Jungeblut, Lynn Jenkins, and Andrew Kolstad, *Adult Literacy in America . . .*, pp. 119-121.

14. See: (i) Vernon M. Briggs, Jr., *Immigration Policy: A Tool of Labor Economics?*, The Jerome Levy Economics Institute of Bard College, Annandale-on-Hudson, New York, 1993; (ii) Vernon M. Briggs, Jr., *Mass Immigration and the National Interest*, M.E. Sharpe Inc., Armonk, New York, 1992.

15. See: George J. Borjas, *Friends or Strangers: The Impact of Immigrants on the U.S. Economy*, Basic Books Inc., New York, 1990, especially pp. 115-142.



CHAPTER THREE

The Literacy Proficiencies of the Labor Force by Industry and Occupation

Much of the debate over the adequacy of the skills of the United States work force has focused on the changing industrial and occupational structure of jobs and on projected changes in employees' job duties, skills, and decision making responsibilities. In *Workplace 2000*, Joseph Boyett and Henry Conn claimed that "the new American workplace will require the most educated work force of any economic system in history."[1] As noted in the Introduction to this report, however, others question this prediction that employment changes in various industries and occupations will produce a net increase in demand for workers with advanced education or literacy skills that will substantively outpace the projected available supply.

This chapter explores these issues and others by analyzing the mean literacy proficiencies of workers in major industrial sectors and in selected occupational groups.[2] Relationships between workers' educational attainments and literacy proficiencies and their access to jobs in various occupations are also examined. The chapter also reviews the literacy skills of front-line, blue-collar workers in the nation's goods-producing industries and of key subgroups of workers in health-related industries, two groups that will play a key role in the United States economy in the coming years. The final section analyzes projected changes in employment in various occupations through the year 2005 and assesses the literacy requirements of these employment shifts.[3]

Literacy Proficiencies of Employees in Various Industry Groups

Mean prose, document, and quantitative proficiencies varied considerably according to the industries in which survey respondents were working or had most recently worked at the time of the survey (Table 3.1, Figure 3.1).[4]

With a few exceptions, the order in which workers in the various industrial sectors performed was identical across the three literacy scales. Employed adults in the finance, insurance, and real estate sector consistently had the highest mean scores, along with workers in public administration.[5] The mean

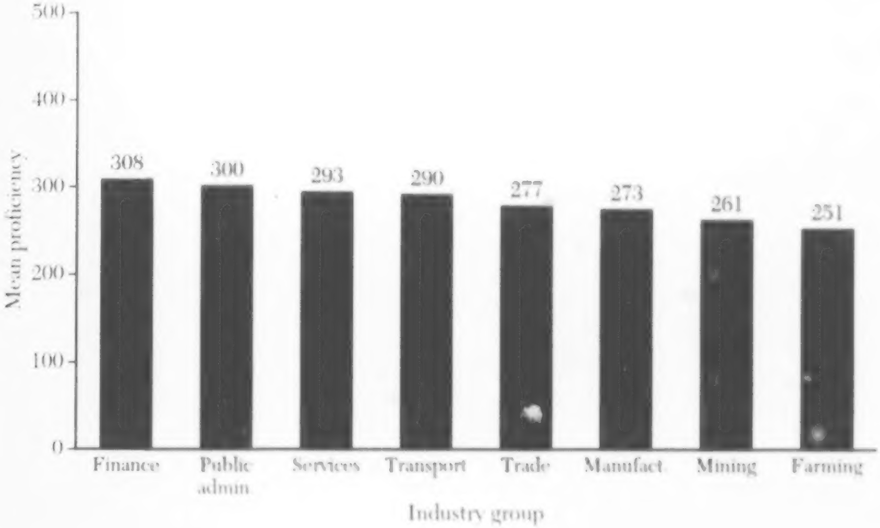
Table 3.1—Mean literacy proficiencies of employed adults by major industry group: 1992

Industry group	Mean proficiency Prose	 Document	 Quantitative
Finance, insurance, real estate	308 (2.0)	301 (1.8)	308 (2.1)
Public administration	300 (2.3)	295 (2.3)	303 (2.5)
Services	293 (1.1)	287 (1.0)	289 (1.1)
Transportation, communications, utilities	290 (2.2)	285 (2.2)	292 (2.3)
Trade	277 (1.3)	274 (1.1)	276 (1.5)
Manufacturing	273 (1.7)	270 (1.9)	277 (1.7)
Construction, mining	261 (2.6)	261 (2.3)	272 (2.4)
Farm, forestry, fishing	251 (5.1)	247 (5.5)	258 (6.6)

Note: Numbers in parentheses are standard errors.

SOURCE: U.S. Department of Education, National Center for Education Statistics, National Adult Literacy Survey, 1992.

Figure 3.1—Mean prose literacy proficiencies of employed adults by major industry group: 1992



SOURCE: U.S. Department of Education, National Center for Education Statistics, National Adult Literacy Survey, 1992.

scores of finance, insurance, and real estate workers were significantly higher than those of workers in all other sectors except public administration. Those employed in manufacturing, in construction and mining, and in agriculture, forestry, and fishing had the lowest mean scores on each scale. These latter three industry categories constitute the nation's goods-producing sector and provide the bulk of our nation's exports to the world economy. The differences in mean scores between the top and bottom performers were quite large, ranging from 50 to 57 points across the scales. This is equivalent to more than one standard deviation in the scores of employees in the finance, insurance, and real estate sector.[6]

One would expect to find some differences in the performance of workers across these industry groups, given wide variations in workers' educational attainments and in the occupational structure of jobs within these sectors. In 1992, for example, 41 percent of the employees in public administration and 36 percent of those in services industries were working in professional, managerial, or technical jobs. In contrast, just 11 percent of the workers in retail trade and only 7 percent of those in agriculture, forestry, and fishing were in these types of jobs.[7] To determine whether workers' proficiencies varied significantly by industrial sector even when their occupations are taken into consideration, it is necessary to compare the mean literacy scores of workers in comparable occupational groups across sectors. In making these more disaggregated comparisons of literacy performance across industrial sectors, we combined workers in selected high-level, white-collar occupations and in selected blue-collar occupations (Table 3.2, Figure 3.2).

Workers in professional, managerial, technical, or high-level sales positions tended to have the highest literacy proficiencies, on average, regardless of the industry in which they worked.[8] For such types of workers in five of the seven industry groups listed in the top half of Table 3.2, mean prose scores were statistically equivalent, ranging from 320 to 326. High-level white-collar workers in finance, insurance, and real estate; public administration; manufacturing; transportation, communications, utilities; and service industries performed comparably. However, the mean prose proficiencies of high-level, white-collar employees in the construction/mining and trade sectors — where the occupational mix features fewer professionals and more managers and high-level sales workers — are about 30 points lower than those of high-level, white-collar employees in other sectors.[9] Similar patterns are found on the document and quantitative scales. Most of the mean score advantages of workers in the finance, insurance, and real estate sector and the public administration sector therefore were attributable to differences in the

Table 3.2—Mean literacy proficiencies of employed adults in selected occupations, by industry group: 1992

Occupation/ industry group	Mean proficiency Prose	Document	Quantitative
Professional, managerial, technical, or high-level sales occupations			
Construction, mining	296 (6.1)	295 (5.9)	309 (6.0)
Manufacturing	321 (1.8)	317 (2.4)	329 (2.7)
Transportation, communications, utilities	325 (5.4)	317 (5.0)	324 (5.5)
Trade	298 (2.4)	294 (2.9)	303 (3.2)
Finance, insurance, real estate	326 (3.7)	317 (3.1)	323 (3.5)
Services	325 (1.2)	316 (1.3)	320 (1.4)
Public administration	324 (4.7)	316 (5.1)	328 (4.8)
Craft, assembler, operative, laborer, or helper occupations			
Construction, mining	255 (2.9)	255 (2.9)	265 (2.9)
Manufacturing	252 (2.0)	249 (2.1)	256 (2.1)
Transportation, communications, utilities	277 (3.9)	273 (4.5)	280 (4.4)
Trade	259 (3.9)	258 (3.1)	262 (3.2)
Services	259 (4.3)	256 (4.4)	258 (4.5)

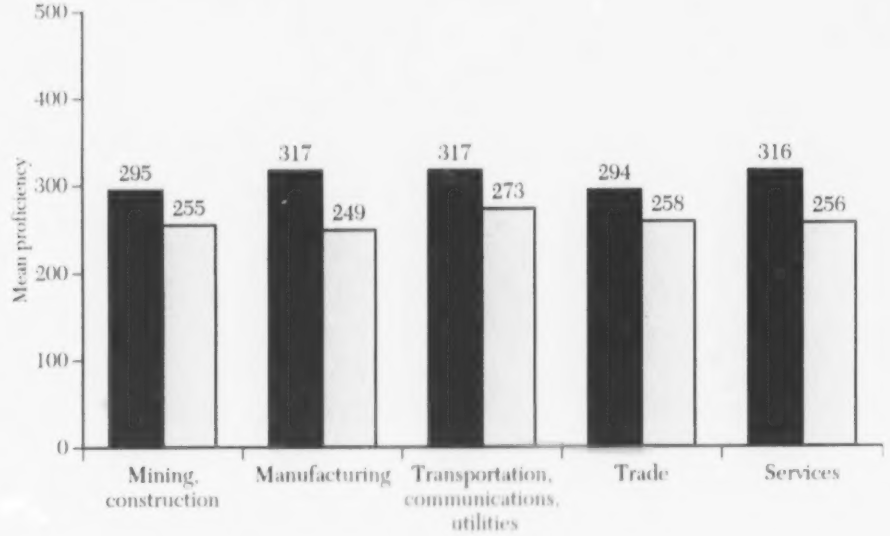
Note: Numbers in parentheses are standard errors.

SOURCE: U.S. Department of Education, National Center for Education Statistics, National Adult Literacy Survey, 1992.

occupational mix of jobs rather than to higher proficiencies of workers within each occupational cluster.

Data on the literacy skills of front-line, blue-collar workers are available for five major industry groups (Table 3.2, bottom half). Overall, front-line workers in these dominant employing industries performed quite poorly, frequently obtaining mean scores in the 250 to 260 range. On each scale, mean scores were highest for front-line workers in transportation, communications, and utilities industries, who significantly outperformed their counterparts in each of the other industry groups by 15 to 25 points. Among the remaining four industrial sectors, front-line, blue-collar workers in manufacturing tended to have the lowest mean proficiencies on each scale; however, none of the differences in performance between front-line workers in manufacturing and those in industries outside of the transportation and communication sectors was statistically significant.[10] The literacy skills of blue-collar workers in key goods-producing industries are examined in more detail later in the chapter.

Figure 3.2—Mean document literacy proficiencies of employed adults in selected occupations, by industry group: 1992



Notes: Black bars represent adults in professional, technical, managerial, or high level sales jobs; grey bars represent adults in craft, assembler, operative, or laborer jobs

SOURCE: U.S. Department of Education, National Center for Education Statistics, National Adult Literacy Survey, 1992.

Literacy Proficiencies of Employees in Various Occupational Groups

The United States economy generated 18 million additional jobs for working-age persons between 1982 and 1992, representing a growth rate of about 18 percent (Table 3.3). Rates of employment growth over this period were highly uneven, however. Following the recovery from the 1981-82 national recession, the number of employed persons rose sharply through 1989, but in mid-1990 the economy entered a recession. Although growth of real output was restored in early 1991, job growth remained quite weak: From 1989 to 1992, total employment rose by only 256,000, or .2 percent.

Employment growth rates also varied widely across major occupational groups. During the 1982 to 1989 boom period, the number of working persons increased in each major occupational category except farm, forestry, and

Table 3.3—Growth in the number of employed persons by occupational group for selected years: 1982-1992

Occupational group	Number employed (in millions) 1982	1989	1992	Percent change, 1982-89	Percent change, 1989-92
Professional	12.820	15.550	16.386	+21%	+5%
Executive, manager, administrator	10.772	14.848	14.767	+38%	-1%
Technical	3.053	3.645	4.253	+19%	+17%
Sales	11.249	14.096	13.919	+25%	-1%
High-level sales, proprietors	6.010	7.811	7.697	+30%	-2%
Other	5.239	6.254	6.232	+19%	-1%
Administrative support	16.507	18.416	18.636	+12%	+1%
Services	13.494	15.556	16.096	+15%	+4%
Precision production, crafts, repair	11.775	13.818	13.128	+17%	-5%
Transport operative	4,198	4,886	4,878	+16%	+0%
Operator, fabricator, assembler	7,874	8,248	7,524	+5%	-9%
Laborer, helper, cleaner	4.478	4.888	4.556	+9%	-7%
Farm, forestry, fishing	3.751	3.421	3.456	-9%	+1%
Total	99.526	117.342	117.598	+18%	+0%

Notes: Numbers are in millions. Population represented is individuals age 16 and older.

SOURCE: U.S. Bureau of Labor Statistics, *Employment and Earnings*, 1984, 1990, 1993.

fishing, where the number of workers declined by nearly 9 percent. Rates of job growth for other occupational groups ranged from highs of 38 percent for executives, managers, and administrators and 30 percent for high-level sales workers and proprietors to a low of 5 percent for operators, fabricators, and assemblers. Thus, from 1982 to 1989, the employment mix shifted toward high-level white-collar occupations and away from blue-collar positions, accelerating a long-term trend.

From 1989 to 1992, the pattern of employment growth was far more varied. The number of technical workers (including many in health-related positions) rose sharply, by 17 percent. Professional and service occupations also experienced increases, fueled by growth in the numbers of health professionals, teachers, and health service workers.[11] In most of the remaining occupational groups, including executives, managers, and administrators; sales workers; and blue-collar workers, the number of employed persons declined. The steepest reductions (7 to 9 percent) occurred in operator, fabricator, assembler, and laborer/helper occupations.

One would expect workers' mean proficiencies to vary considerably by occupational group, given substantial variability in their levels of education and corresponding variations in literacy proficiencies.[12] According to the findings of the Current Population Survey for March 1992, roughly 86 percent of the nation's employed (age 16 and older) had earned a high-school diploma or GED certificate, 51 percent had completed some postsecondary education, 31 percent had earned a two-year degree or higher, and just under one-fourth had received a four-year or advanced degree (Table 3.4). The fraction of the employed with a two-year degree or higher varied widely across the 11 occupational groups examined, ranging from 82 percent of professional workers and 54 percent of executives, managers and administrators to only 6 to 7 percent of those employed as transport operatives; precision production and crafts workers; and laborers, helpers, or cleaners. At the other end of the spectrum, only 2 to 3 percent of the nation's professionals, executives, and technical workers had not completed high school or a GED, compared with one-third of laborers, helpers, cleaners, and farm, forestry, and fishing workers.

Table 3.4—Highest level of education attained, by occupational group: March 1992

	Percent who attained each level of education				
Occupational group	**No h.s. diploma or GED**	**H.S. diploma or GED**	**Some post-secondary no degree**	**2-year degree or higher**	**4-year degree or higher**
Professional	2	7	10	82	74
Executive, manager, administrator	3	23	20	54	46
Technical	3	25	29	44	27
Sales	12	34	25	30	24
Administrative support	6	44	28	23	14
Services	26	42	20	12	6
Precision production, crafts, repair	19	49	19	13	6
Transport operative	24	51	18	7	4
Operator, assembler, fabricator	28	52	13	7	4
Laborer, helper, cleaner	32	47	14	7	4
Farm, forestry, fishing	35	39	13	12	8
Total	14	35	20	31	25

SOURCE: March 1992 Current Population Survey data, tabulations by Center for Labor Market Studies, Northeastern University.

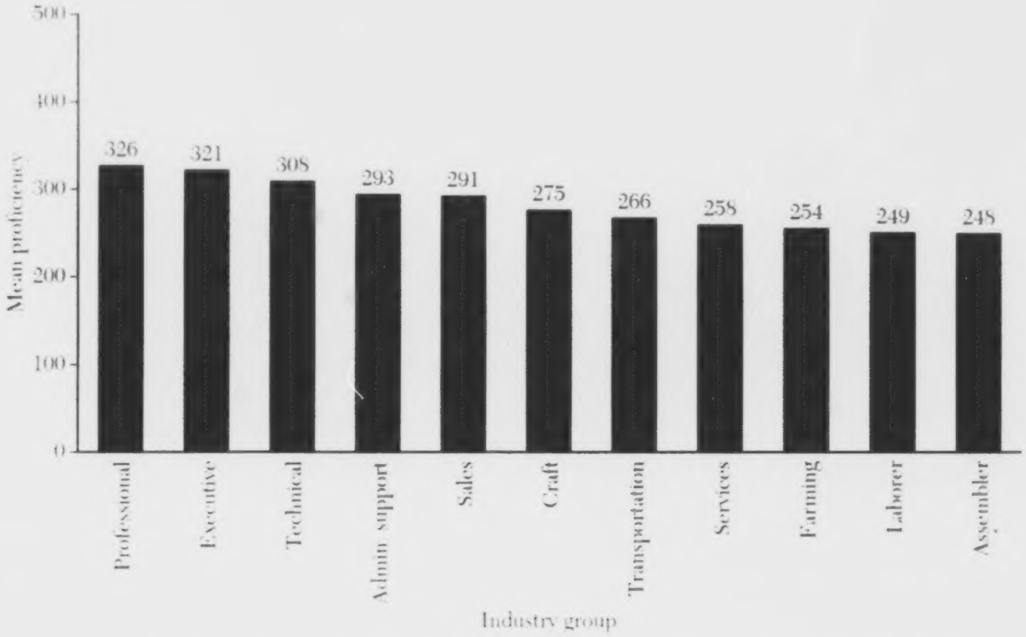
Table 3.5—Mean literacy proficiencies, by major occupational group: 1992

	Mean proficiency		
Occupational group	**Prose**	**Document**	**Quantitative**
Professional	329 (1.4)	321 (1.4)	326 (1.3)
Executive, manager, administrator	319 (2.1)	310 (1.6)	321 (1.0)
Technical	309 (2.5)	308 (2.9)	308 (2.6)
Administrative support	296 (1.2)	290 (1.4)	293 (1.4)
Sales	290 (2.0)	285 (1.6)	291 (1.8)
Craft, precision production	267 (2.1)	267 (2.0)	275 (2.3)
Services	262 (1.4)	259 (1.5)	258 (1.7)
Transport operative	258 (2.5)	260 (2.4)	266 (2.6)
Laborer, helper, cleaner	248 (3.8)	247 (3.3)	249 (3.6)
Assembler, fabricator, operator	247 (2.2)	242 (2.4)	248 (2.4)
Farm, forestry, fishing	245 (4.8)	245 (5.3)	254 (6.6)

Note: Numbers in parentheses are standard errors.

SOURCE: U.S. Department of Education, National Center for Education Statistics, National Adult Literacy Survey, 1992.

Figure 3.3—Mean quantitative literacy proficiencies, by occupational group: 1992



SOURCE: U.S. Department of Education, National Center for Education Statistics, National Adult Literacy Survey, 1992.

Given these differences in educational attainment, it is not surprising to find considerable differences in literacy skills across the occupational groups (Table 3.5, Figure 3.3). Professionals performed the best on each of the three literacy scales, followed by executives, managers, and administrators, and by technical employees. Laborers and helpers; assemblers, fabricators, and operators; and farm, forestry, and fishing workers performed the worst. The gaps between the mean scores of professionals and employees in the latter three occupational groups ranged from 75 to 80 points across the scales. These differences were equivalent to 1.6 to 1.8 standard deviations in the scores of professional workers.

Literacy Proficiencies of Workers in Various Occupational Groups by Sex and Race/Ethnicity

On each literacy scale, the rankings of major occupational groups are comparable for men and women (Tables 3.6). For both groups, professionals, managers, and technical workers, respectively, had the highest mean scores, while assemblers and operators; laborers, helpers, and cleaners; and farm, forestry, and fishing workers had the lowest. The differences in mean scores between professional workers and the least proficient occupational groups typically ranged from 80 to 90 points for men and women alike.

Looking within each of the major occupational groups, one finds no statistically significant differences between the mean prose scores of men and women in professional, management, and technical positions. Among those employed in sales and semi-skilled blue collar occupations, however, males had moderate but statistically significant (8- to 11-point) advantages over women in the area of prose literacy. Among those employed in administrative support and transport operative occupations, women had significantly higher mean prose scores than men. On the document scale, there were no significant differences between men and women in eight of the eleven occupational groups, but males did outscore females in technical, sales, and assembler or operative occupations. Males had significantly higher mean quantitative scores than women in six of the eleven occupational groups, including all high-level, white-collar occupations, and in certain blue-collar jobs, including craft and assembler/fabricator positions.

As was found in the results for all employed workers, White professionals, on average, achieved the highest mean scores on each scale, significantly outperforming those in other high-level, white-collar occupations, including executives, managers, administrators, and technical workers (Table 3.7). Assemblers, fabricators, and operators; laborers, helpers, and cleaners; and

Table 3.6—Mean literacy proficiencies of employed men and women, by major occupational group: 1992

Literacy scale/ occupational group	Mean proficiency	
	Men	Women
Prose		
Professional	330 (2.5)	329 (1.5)
Executive, manager, administrator	317 (2.6)	321 (2.6)
Technical	309 (3.7)	308 (3.8)
Sales	295 (2.8)	286 (2.2)
Administrative support	288 (2.8)	298 (1.2)
Craft and precision production	269 (2.2)	257 (6.3)
Services	261 (2.2)	263 (2.0)
Transport operative	256 (2.7)	275 (6.2)
Assembler, operator, fabricator	251 (3.0)	241 (3.5)
Laborer, helper, cleaner	249 (4.0)	245 (7.4)
Farm, forestry, fishing	245 (4.9)	246 (14.1)
Document		
Professional	323 (2.7)	319 (1.5)
Executive, manager, administrator	310 (2.4)	310 (2.5)
Technical	316 (4.5)	300 (3.0)
Sales	290 (2.5)	281 (1.9)
Administrative support	285 (3.4)	291 (1.4)
Craft and precision production	268 (1.9)	256 (6.4)
Services	260 (2.4)	258 (2.1)
Transport operative	258 (2.6)	273 (7.8)
Assembler, operator, fabricator	249 (2.8)	233 (4.0)
Laborer, helper, cleaner	248 (3.4)	241 (6.3)
Farm, forestry, fishing	246 (4.9)	241 (15.2)
Quantitative		
Professional	334 (2.0)	320 (2.0)
Executive, manager, administrator	325 (2.4)	314 (2.9)
Technical	315 (4.1)	300 (3.2)
Sales	303 (2.4)	282 (2.2)
Administrative support	293 (3.0)	294 (1.3)
Craft and precision production	277 (2.3)	256 (6.6)
Services	261 (2.7)	256 (2.3)
Transport operative	265 (2.8)	274 (6.5)
Assembler, operator, fabricator	257 (3.2)	236 (3.4)
Laborer, helper, cleaner	251 (3.9)	243 (6.9)
Farm, forestry, fishing	256 (5.7)	243 (18.0)

Note: Numbers in parentheses are standard errors.

SOURCE: U.S. Department of Education, National Center for Education Statistics, National Adult Literacy Survey, 1992.

farm, forestry, and fishing workers were at the bottom of the White score distribution on each scale. Their mean proficiencies generally were 60 to 70 points below those of White professionals.

Among Black employees, mean literacy scores were also highest among professionals, executives and managers, and technical workers. Unlike the pattern for Whites, however, there were no significant differences in mean proficiencies between Black professionals and those in executive, management, administrative, or technical positions. Administrative support and sales workers occupied the middle of the Black score distribution on each literacy scale, while all remaining blue-collar and service employees fared about equally well. The differences in mean scores between Black professionals and executives and those in service and blue-collar occupations were 50 to 60 points on each scale.

Among Hispanic workers, mean proficiencies were highest for professionals, executives, managers, administrators, and technical workers, yet there were no significant differences in performance among these three occupational groups on any of the scales. Hispanic assemblers and operators; laborers, helpers, and cleaners; and farm, forestry, and fishing workers occupied the bottom of the score distribution on each scale, with mean scores typically ranging from 180 to 190. Across the scales, their scores were often more than 100 points lower than those of Hispanic professionals and managers.

Within each major occupational group, there are large and statistically significant differences in performance, on average, between the mean scores of Whites and those of Blacks and Hispanics. The proficiency gaps between White and Black adults in the highest-performing occupations (professionals, executives, managers) are, in many cases, as large as those between White and Black adults in the lowest-performing occupations (laborers, service workers). The gaps in mean scores between White and Black workers in administrative support and semi-skilled blue-collar occupations are somewhat smaller (32 to 40 points), however.

While the differences in mean literacy proficiencies between White and Hispanic employees are statistically significant in every major occupational category, they tend to be far smaller among executives and managers (30 to 34 points), professionals, (41 points), and technical workers (43 points) than among blue collar, service, and farm, forestry, and fishing workers (70 to 120 points). The extremely low average scores of Hispanic workers in the latter occupations were influenced by a relatively high concentration of recent immigrants with limited English skills.

Table 3.7—Mean literacy proficiencies of employed White, Black, and Hispanic adults, by major occupational group: 1992

Occupational group	Mean proficiency White	 Black	 Hispanic
Prose			
Professional	335 (1.5)	287 (4.0)	287 (6.1)
Executive, manager, administrator	323 (2.3)	285 (5.4)	291 (13.2)
Technical	316 (2.7)	282 (5.2)	272 (8.6)
Administrative support	303 (1.5)	271 (2.8)	266 (3.8)
Sales	300 (2.1)	261 (2.9)	246 (6.3)
Services	282 (1.6)	231 (2.2)	211 (5.8)
Craft	278 (2.2)	222 (6.9)	208 (4.8)
Transport operative	273 (3.2)	220 (7.0)	219 (9.8)
Farm, forestry, and fishing	268 (3.5)	——	155 (8.2)
Assembler, fabricator, operator	268 (2.9)	233 (3.6)	179 (6.6)
Laborer, helper, cleaner	268 (4.2)	224 (6.7)	188 (8.0)
Document			
Professional	326 (1.5)	277 (3.2)	282 (6.3)
Executive, manager, administrator	314 (1.8)	273 (5.5)	285 (11.8)
Technical	315 (3.0)	278 (7.8)	275 (9.7)
Administrative support	297 (1.7)	264 (2.8)	264 (3.7)
Sales	294 (1.6)	257 (3.6)	248 (5.2)
Services	278 (1.9)	225 (2.5)	210 (6.0)
Craft	277 (2.3)	219 (6.2)	212 (5.7)
Transport operative	274 (2.9)	218 (6.6)	228 (9.6)
Farm, forestry, and fishing	267 (3.9)	——	151 (9.2)
Assembler, fabricator, operator	263 (3.0)	226 (4.3)	179 (7.2)
Laborer, helper, cleaner	267 (3.9)	218 (6.0)	191 (10.6)
Quantitative			
Professional	332 (1.4)	275 (3.6)	290 (6.3)
Executive, manager, administrator	326 (1.7)	278 (5.2)	291 (12.0)
Technical	316 (2.8)	268 (7.5)	273 (7.5)
Sales	302 (2.0)	252 (3.3)	248 (5.8)
Administrative support	302 (1.6)	261 (3.5)	265 (4.2)
Craft and precision production	286 (2.5)	220 (6.6)	214 (4.4)
Services	279 (1.9)	217 (2.8)	206 (6.4)
Transport operative	282 (3.2)	217 (7.4)	228 (10.2)
Assembler, fabricator, operator	271 (2.9)	226 (5.1)	180 (6.5)
Laborer, helper, cleaner	271 (3.6)	217 (6.5)	188 (10.8)
Farm, forestry, fishing	280 (3.8)	——	149 (9.7)

Note: —— indicates that the number of cases is too small to provide reliable estimates. Numbers in parentheses are standard errors.

SOURCE: U.S. Department of Education, National Center for Education Statistics, National Adult Literacy Survey, 1992.

Literacy Proficiencies, Formal Educational Attainments, and Access to Occupations

The formal educational attainments and literacy skills of workers varied widely across the major occupational groups. To identify how strongly these two sets of human capital traits jointly influence access to employment in selected occupational clusters, the authors calculated the percentage of the nation's employed 22- to 65-year-olds who held professional, managerial, or technical positions at the time of the survey (Table 3.8). Employment in these high-level, white-collar occupations — which constitute the core of the "college labor market" — grew at an above-average pace from 1982 to 1992, a trend that is projected to continue throughout the next decade.[13]

Approximately 27 of every 100 employed 22- to 65-year-olds in the United States in 1992 worked in professional, management, or technical occupations. The proportion of the employed who did so was strongly associated with their formal educational attainment. For example, only 3 to 4 percent of employees who lacked a high-school diploma or GED had access to such occupations, compared with 9 percent of high-school graduates, 38 percent of those with associate's degrees, and 71 percent of those with bachelor's or higher academic degrees.

Access to employment in professional, management, and technical occupations also was strongly associated with prose proficiency. Only 5 percent of the employed whose prose scores were in the Level 1 range worked in one of these high-level, white-collar jobs, in contrast to 26 percent of the workers in Level 3 and nearly 72 percent of those in Level 5. Within each educational attainment subgroup of the employed, the likelihood of obtaining a professional, managerial, or technical position rose consistently with the level of prose literacy. Among high-school graduates, only 5 percent of those in Level 1 were employed in such occupations, compared with nearly 10 percent of those in Level 3 and 15 percent of those in Level 5. Among four-year college graduates, the share of the employed holding professional, management, or technical occupations rose from 46 percent of those in Level 1 to 64 percent in Level 3 to 88 percent in the highest proficiency level. Clearly, the more years of formal schooling completed by employees and the better their prose proficiencies, the greater their likelihood of working in professional, management, or technical occupations.

On average, less educated and less literate workers are concentrated in service, laborer, helper, cleaner, farm, forestry, and fishing occupations.[14] Nearly half the employed adults with only a primary school education and 39 percent of those who left high school without a diploma worked in such occupations. In contrast, only 13 percent of employed adults with associate's degrees and 6

Table 3.8—Percent of employed adults with specified educational attainment and prose proficiency levels who were able to obtain employment in selected occupational groups: 1992

Occupation/ educational attainment	Percent in level... 1	2	3	4	5	All
Professional, managerial, or technical occupations						
0 to 8 years	2	6	6	39	——	3
9 to 12 years	2	7	6	11	——	4
High-school diploma or GED	6	9	10	12	15	9
Some postsecondary	9	17	21	29	44	22
Two-year degree	28	29	37	43	40	38
Four-year degree or higher	46	56	64	75	83	71
All workers	5	14	26	50	72	27
Service, laborer, helper, cleaner, farm, forestry, fishing occupations						
0 to 8 years	49	42	38	24	——	47
9 to 12 years	43	40	34	28	29	39
High-school diploma or GED	44	31	25	19	8	29
Some postsecondary	40	25	19	15	9	20
Two-year degree	20	14	14	12	11	13
Four-year degree or higher	11	7	8	5	2	6
All workers	44	29	20	11	4	23

Note: —— indicates that the number of cases is too small to provide reliable estimates.

An example of how to interpret findings from this table: Of those employed persons with a two-year degree and prose proficiencies in level 3, 37 percent were able to obtain employment in a professional, managerial, or technical occupation.

SOURCE: U.S. Department of Education, National Center for Education Statistics, National Adult Literacy Survey, 1992.

percent of those with bachelor's degrees did so. Further, nearly 44 percent of the employees who scored in the lowest level of prose literacy worked in these occupations, in contrast to 20 percent of the employees in Level 3 and only 4 percent of those in Level 5. In every educational attainment subgroup, the share of the employed who worked in service, laborer, farm, forestry, or fishing occupations declined as their prose skills increased. Clearly, then, formal schooling and literacy skills played important roles in sorting workers among occupations in the early 1990s.

Literacy Proficiencies of Front-line Blue-collar Workers

In recent years, human resource analysts in this country have underscored the need to bolster the knowledge and skills of front-line workers in all industries to help achieve the national economic goals of higher productivity and increased international competitiveness.[15] Most definitions of front-line workers include some white-collar and service workers as well as blue-collar workers. In this report, crafts workers, assemblers, fabricators, operatives, laborers, and helpers are included in the definition to permit analyses of the literacy skills of front-line workers in the nation's nonagricultural goods-producing industries. These industries, which include construction, manufacturing, and mining, are the dominant employers of blue-collar workers. The performance of the nation's manufacturing industries is particularly important for our international competitiveness, given that about one-fourth of their output is exported, and a substantial share of this output (70 percent or more) is believed to be in competition with foreign producers.[16]

The mean literacy proficiencies of the nation's front-line blue-collar workers in goods-producing industries (253 on the prose scale, 254 on the document scale, and 263 on the quantitative scale) are well below those for the nation's full-time employed as a whole. The differences between these groups range from 22 to 37 points across the scales (Table 3.9). High percentages of front-line blue-collar workers performed in the two lowest literacy levels. More than 60 percent scored in Level 1 or 2 on the prose and document scales, and 53 percent performed in these two levels on the quantitative scale. Not all front-line workers possess limited literacy skills. On each scale, blue-collar employees can be found in each proficiency level. Yet, only about 10 percent of

Table 3.9—Percentage distribution of front-line blue-collar workers in construction, manufacturing, and mining industries across the literacy levels, and mean proficiencies: 1992

	Percent in level...					Mean
Literacy scale	**1**	**2**	**3**	**4**	**5**	**proficiency**
Prose	28	34	29	8	1	253 (2.9)
Document	28	33	29	10	1	254 (2.8)
Quantitative	24	29	32	13	2	263 (3.0)

Note: Numbers in parentheses are standard errors.

SOURCE: U.S. Department of Education, National Center for Education Statistics, National Adult Literacy Survey, 1992.

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these individuals scored in Level 4 or 5 on the prose and document scales. On the quantitative scale, 15 percent attained the two highest levels.

Clearly, then, many front-line blue-collar workers display limited literacy proficiencies. Despite frequent media stories portraying businesses' dissatisfaction with existing workers' skills and their need to invest in basic literacy training, however, few front-line blue-collar workers receive such investments either on or off the job. Observers point out that firms are less likely to target front-line workers than managers and professionals for training. In recent testimony before the U.S. House of Representatives Manufacturing Task Force, Anthony Carnevale of the American Society for Training and Development remarked, "Not enough skill development has been focused on front-line production and service personnel and other blue-collar non-supervisory workers who make the products, deliver the services, and serve the customers."[17] A 1991 national survey on the job training experiences of the employed found that slightly less than 3 percent of skilled blue-collar workers, less than 2 percent of operators, fabricators, and assemblers, and only 1 percent of laborers, helpers, and handlers had received any reading, writing, or mathematics training since they acquired their current jobs.[18]

Literacy Proficiencies of Health Care Workers

The nation's health services industries expanded the number of wage and salary workers on their payrolls by 7.84 million, or nearly 90 percent, from 1975 to 1990.[19] This rate of job growth was more than twice as high as that for all nonagricultural industries in the nation. The U.S. Bureau of Labor Statistics recently projected that employment in health services industries will continue to grow at above-average rates from 1990 to 2005, with a projected net increase of 3.7 million jobs, accounting for nearly one of every six net new wage and salary jobs in the country.[20]

Given the growing importance of the nation's health care industries — hospitals, medical centers, doctors' and dentists' offices, health maintenance organizations, and nursing homes — as employers of the American work force, it is important to analyze the literacy skills of workers in these industries (Table 3.10). The mean literacy scores of all health industry workers, including the self-employed, were 284 on the document scale, 285 on the quantitative scale, and 293 on the prose scale. While the mean prose proficiency of health industry workers was 5 points higher than that of all full-time workers (significant at the .05 level), their mean document score was nearly 6 points lower and the mean quantitative scores of the two groups were equivalent.

The distribution of health industry workers across the proficiency levels varies across the literacy scales. On each scale, however, about four of every 10 health industry workers scored in Level 1 or 2. At the other end of the distribution, 25 to 30 percent performed in the Level 4 or 5 range on each scale.

The health care sector includes a heterogeneous set of jobs, including surgeons, physicians, and dentists, as well as technicians, medical records clerks, managers, nurse aides, and orderlies. To explore the degree of variability in the literacy skills of workers in some key health-related occupational clusters, the authors estimated the median scores and percentile rankings of four subgroups: health diagnostic workers (dentists, doctors, optometrists), registered nurses, health technicians and technologists, and health service workers (ambulance drivers, medical assistants, nursing and psychiatric aides). In 1990, about 6.4 million wage and salary workers were employed in these occupations in the United States.[21]

As anticipated, the median literacy scores of workers in these four occupational clusters varied substantially across the scales, with health diagnostic workers demonstrating the highest median proficiencies and health service workers demonstrating the lowest (Table 3.11). On the prose scale, for example, the median score of health diagnostic workers was 346, compared with 329 for registered nurses, 313 for health technicians, and 257 for health service workers. The absolute difference between the median scores of health diagnostic and health service workers was nearly 90 points. Similar patterns are found for the document and quantitative scales, with 76 to 78 points separating the median scores of health diagnostic and health service workers.

Table 3.10—Distribution of workers in health-related industries across the literacy levels, and mean proficiencies: 1992

	Percent in level...					Mean
Literacy scale	**1**	**2**	**3**	**4**	**5**	**proficiency**
Prose	13	23	34	25	6	293 (1.8)
Document	16	25	34	21	4	284 (1.8)
Quantitative	17	23	34	22	4	285 (1.8)

Note: Numbers in parentheses are standard errors.

SOURCE: U.S. Department of Education, National Center for Education Statistics, National Adult Literacy Survey, 1992.

Table 3.11—Median literacy proficiencies of health workers, by occupational group: 1992

Occupational group	Median proficiency Prose	 Document	 Quantitative
Health diagnostic	346	334	333
Registered nurses	329	315	312
Health technicians	313	308	304
Health service	257	258	256

SOURCE: U.S. Department of Education, National Center for Education Statistics, National Adult Literacy Survey, 1992.

The differences in median literacy scores among workers in the four health-related occupational clusters are accompanied by fairly large differences in their formal educational attainments. In 1990, most workers in health diagnostic occupations had completed two to three years of schooling beyond the bachelor's degree, while the typical health technician had completed one to two years of college and the typical health service worker had ended his or her schooling upon receiving a high-school diploma.[22]

Literacy Implications of Projected Employment Changes, 1990 to 2005

In recent debates about the literacy skills of American students and workers, one of the more controversial questions is whether existing literacy proficiencies are adequate to meet changing demands brought about by shifts in the occupational and skills composition of jobs in the United States economy. A rigorous assessment of this key human resource issue requires knowledge of the occupational structure of jobs that will prevail in some target year, the literacy skills that will be required of workers in these future jobs, and the skills that will likely be possessed by available workers in that target year. A comparison of these "required" literacy skills with the projected "actual" skills of the work force would offer needed insights into the potential for a literacy skills mismatch in this country.

To explore the potential for such a mismatch, the authors combined recent national employment projections of the U.S. Bureau of Labor Statistics with National Adult Literacy Survey findings on the existing literacy skills of workers in different occupations and on projected changes in the composition and skills of the work force.

Using different sets of economic and political assumptions and economic growth scenarios, ranging from low growth to moderate and high growth, the U.S. Bureau of Labor Statistics has projected national employment figures by industry and occupation for the years 1990 to 2005.[23] The authors used the projections based on the moderate growth scenario, which assumed a 2.3 percent annual average rate of growth in real Gross National Product. Under this scenario, the total number of employed persons in this country was projected to rise from 122.6 million in 1990 to 147.2 million in the year 2005, a gain of 24.6 million employed persons, or 20 percent.[24] Employment in professional, technical, and management-related occupations was predicted to grow at above-average rates, as was employment in many service occupations, while employment in craft jobs; semi-skilled and unskilled blue-collar jobs; and farm, forestry, and fishing jobs were expected to grow at rates well below the average for all occupations.[25] These occupational employment shifts will increase the demand for workers with postsecondary education. Some economic analysts believe that these Bureau of Labor Statistics employment projections underestimate the future demand for professional, management, and technical workers and that a shortage of college graduates will prevail in the absence of substantive college enrollment and retention changes.[26]

Although the U.S. Bureau of Labor Statistics projects future employment for some 500 occupations, the National Adult Literacy Survey sample is not large enough to provide reliable estimates of the literacy proficiencies of workers in all of them. To provide a close match between occupational employment data from the two surveys, the authors collapsed the Bureau's occupational employment categories into 33 subgroups. The projected absolute and relative changes in employment in these 33 occupations from 1990 to 2005 are displayed in Table 3.12. The occupations are ranked in descending order by their projected growth rate (relative change) over this 15-year period. The projected growth rates vary considerably, ranging from a 54 percent increase for math, computer, and natural scientists to a 15 percent decline for farm, forestry, and fishing managers and operators.

What literacy skills will be needed to support this projected set of jobs? The National Adult Literacy Survey provides estimates of the mean proficiencies of workers in each occupational cluster during 1992 (Table 3.13). A number of important skill differences among these occupational subgroups are evident. Among professional and management support workers, math, computer, and natural scientists and accountants and auditors ranked among the highest performers on each literacy scale, outscoring the "other

Table 3.12—Projected employment trends by occupational subgroup, ranked by relative projected change in employment: 1990 to 2005

Occupational subgroup	1990 actual number of workers	2005 projected number of workers	Absolute change, 1990 to 2005	Relative change, 1990 to 2005
Math, computer, other natural scientists	945,000	1,458,000	513,000	54%
Registered nurses	1,727,000	2,494,000	767,000	44%
Personal service	2,192,000	3,164,000	972,000	44%
Health services	1,972,000	2,832,000	860,000	44%
Health, other technicians	2,877,000	4,114,000	1,237,000	43%
Information clerks	1,418,000	2,003,000	585,000	41%
Accountants, auditors	985,000	1,325,000	340,000	35%
Health diagnostic, other health assessment and treating	1,433,000	1,911,000	478,000	33%
Private executives, managers	1,589,000	2,098,000	509,000	32%
Public safety, except security	1,166,000	1,535,000	369,000	32%
Other professional	4,422,000	5,750,000	1,328,000	30%
Teachers	5,379,000	6,902,000	1,523,000	28%
Other services	13,093,000	16,720,000	3,627,000	28%
Engineers	1,519,000	1,919,000	400,000	26%
Other management, management support	9,456,000	11,937,000	2,481,000	26%
Other sales	9,426,000	11,698,000	2,272,000	24%
Adjusters, investigators	1,058,000	1,313,000	255,000	24%
Engineering, science technicians	1,327,000	1,640,000	313,000	23%
Sales representatives, supervisors	1,043,000	1,286,000	243,000	23%
Office supervisors, managers	1,218,000	1,481,000	263,000	22%
Transportation equipment operators	4,730,00	5,743,000	1,013,00	21%
Public executives, managers	419,000	508,000	89,000	21%
Construction crafts	3,763,000	4,557,000	794,000	21%
Other farm, forestry, fishing	2,063,000	2,410,000	347,000	17%
Secretaries	3,576,000	4,116,000	540,000	15%
Communications equipment operators	320,000	361,000	41,000	13%
Other crafts workers	9,395,000	10,377,000	982,000	11%
Other administrative support	13,258,000	14,568,000	1,310,000	10%
Cleaning equipment, handlers, helpers, laborers	4,935,000	5,332,000	397,000	8%
Other fabricators, assemblers, inspectors	8,439,000	7,827,000	-522,000	-6%
Stenographers, typists	1,104,000	994,000	-110,000	-10%
Fabricators, assemblers, inspectors	3,343,000	2,966,000	-377,000	-11%
Farm, forestry, fishing managers, operators	1,296,000	1,105,000	-191,000	-15%

SOURCE: U.S. Department of Labor, Bureau of Labor Statistics, *Outlook 1990-2005*.

Table 3.13—Mean literacy proficiencies by occupational subgroup: 1992

Occupational subgroup	Mean proficiency Prose	 Document	 Quantitative
Math, computer, other natural scientists	348 (2.6)	340 (2.6)	349 (2.8)
Accountants, auditors	341 (2.9)	334 (2.9)	346 (3.2)
Health diagnostic, other health assessment and treating	338 (3.2)	326 (3.4)	328 (3.3)
Teachers	328 (1.4)	320 (1.5)	325 (1.5)
Engineers	328 (3.2)	328 (3.2)	351 (3.2)
Registered nurses	326 (2.2)	313 (2.3)	313 (2.4)
Other professional workers	322 (1.6)	314 (1.6)	317 (1.7)
All other management, management support	318 (2.5)	308 (2.7)	316 (2.6)
Private executives, managers	317 (1.6)	311 (1.6)	322 (1.6)
Public executives, managers	315 (4.7)	294 (4.4)	313 (5.1)
Health, other technicians	311 (2.0)	307 (2.0)	305 (2.2)
Adjusters, investigators	307 (3.1)	301 (3.2)	309 (3.2)
Sales representatives, supervisors	304 (1.5)	295 (1.5)	308 (1.5)
Office supervisors, managers	303 (2.6)	299 (2.7)	305 (2.7)
Information clerks	300 (2.7)	290 (2.7)	288 (2.8)
Public safety occupations, except security	300 (2.8)	300 (2.9)	305 (3.2)
Engineering, science technicians	300 (3.7)	311 (3.7)	308 (3.9)
Secretaries	298 (1.7)	291 (1.7)	294 (1.8)
All other administrative support	293 (1.0)	288 (1.0)	291 (1.1)
Communications equipment operators	289 (4.9)	288 (4.6)	290 (5.2)
Stenographers, typists	282 (4.8)	284 (5.6)	289 (5.9)
All other sales	279 (1.4)	277 (1.4)	279 (1.5)
Personal service occupations	279 (2.2)	271 (2.2)	274 (2.3)
Other craft workers	270 (1.7)	270 (1.7)	276 (1.8)
Construction crafts	262 (2.3)	262 (2.4)	273 (2.4)
Transportation operators	258 (2.2)	260 (2.2)	266 (2.3)
Farm, forestry, fishing, managers, operators	258 (4.2)	258 (4.5)	282 (4.6)
All other services	258 (1.3)	255 (1.3)	253 (1.3)
Health services	253 (2.2)	248 (2.4)	247 (2.4)
Fabricators, assemblers, hand workers, inspectors, testers	252 (3.2)	248 (3.2)	256 (3.4)
Cleaning equipment, handlers, helpers, laborers	248 (2.0)	247 (2.1)	249 (2.2)
All other fabricators, assemblers, inspectors	244 (2.2)	239 (2.2)	244 (2.4)
All other farm, forestry, fishing workers	240 (4.0)	241 (3.9)	243 (4.3)
Total	285	280	285

Note: Numbers in parentheses are standard errors.

SOURCE: U.S. Department of Education, National Center for Education Statistics, National Adult Literacy Survey, 1992; and U.S. Bureau of Labor Statistics.

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professional" subgroup by 20 to 30 points on each scale. Among workers in sales occupations, the mean scores of sales representatives and supervisors were 18 to 30 points higher than those of other sales workers. In service occupations, public safety workers (fire- and police-related) had mean scores that were 50 points above those of health service workers. Farm, forestry and fishing managers and operators significantly outperformed other farm, forestry, and fishing workers, by 18 points on the prose and document scales and nearly 40 points on the quantitative scale.

On each of the literacy scales, the five occupational subgroups that had the highest mean scores were professional and management-related workers: math, computer, and natural scientists; accountants and auditors; health diagnostic workers; teachers; and engineers. Scientists consistently ranked first or second. At the other end of the distribution, the groups with the lowest mean scores on each scale were cleaners, helpers, and laborers; "other" fabricators, assemblers, and operators; and "other" farm, forestry, and fishing workers (not farm managers or operators). The gaps in mean scores between the top and bottom performers are extraordinarily large, often exceeding 95 to 100 points, or two full standard deviations.

A key question is whether the skills of adults within each occupational group will be raised over the next decade in response to demands for higher skills in the workplace, and particularly to support the implementation of high performance work organizations. The nation may wish to set a goal of raising the literacy proficiencies of future American workers regardless of perceived trends in occupational skill requirements. A more literate work force should be more flexible, more creative, more productive, more capable of working in small teams and assuming greater decision-making responsibility, and more capable of favorably responding to job displacement. As noted in the Introduction, findings of prior research on the impacts of technological change, industrial restructuring, and work redesign on skill requirements within and among job clusters have been mixed. While skill demands on average appear to have risen over the past 25 years, there is no solid evidence that the pace of change has been accelerating.[27] Recent studies suggest that production jobs are becoming "upskilled" while many clerical jobs are becoming "deskilled" due to changes in office automation and work restructuring.[28] In its review of changing job skills in a diverse set of industries, the Commission on the Skills of the American Work Force concluded that deskilling seems to be as common as upskilling.[29]

Few previous studies of occupational change have attempted to estimate the literacy implications of the changing job structure. To construct such estimates, the authors used the 1992 mean proficiencies of employed workers in the 33 major occupational groups to represent the required average proficiencies for such jobs in the year 2005. If literacy requirements are raised over time by employers, then these projections for the year 2005 will be biased downward. Harder evidence is needed, however, before the assumption of unchanged literacy requirements within existing occupational clusters is altered.

The mean literacy proficiencies needed to support the 1990 occupational distribution of jobs were estimated by multiplying the mean scores of workers in each occupational cluster by the number of persons employed in that cluster in 1990 (Table 3.14).[30] The estimated mean scores of workers that year ranged from 279 on the document scale to about 284 on the prose and quantitative scales.

As seen in Table 3.12, 15 occupational clusters are projected to experience employment growth rates of 25 percent or more from 1990 to the year 2005. The number of jobs in these 15 occupational clusters combined is projected to increase by nearly 16 million, or 32 percent, over this 15-year period. While most of these occupations are in the professional ranks, they include several management-related occupations and three service clusters. Given the mean literacy scores of workers in these 15 occupational clusters in 1992, it is estimated that new jobs in these high-growth clusters will require mean proficiencies of 294 on the document scale, 297 on the quantitative scale, and 301 on the prose scale — 13 to 17 points higher than those for all workers in the United States in 1990. Many of the new jobs in rapidly growing occupations will therefore require higher than average literacy proficiencies.

In addition to examining the literacy skills needed for high-growth jobs, the authors estimated literacy requirements for all new jobs that are expected to be generated between 1990 and 2005. As seen in Table 3.13, 29 of the 33 occupational clusters are projected to experience some employment growth across this 15-year period, with the creation of nearly 25 million new jobs. The mean literacy scores for these new jobs range from 288 on the document scale to 293 on the prose scale. These scores are 7 to 9 points higher than those for all workers in 1990, only about half the size of the differences for the most rapidly growing occupations.

Four occupational clusters, including both subsets of semiskilled blue-collar workers, are projected to experience employment declines from 1990 to 2005, with a combined job loss of 1.2 million. In three of these four groups, the mean proficiencies of workers are well below those of all workers. The estimated mean scores of workers in the 1.2 million jobs that will be lost range from 249 on the document scale to 258 on the quantitative scale. These scores are 33 to 40 points below those for jobs projected to increase between 1990

Table 3.14—Differences in mean literacy proficiency requirements for various subgroups of U.S. workers: 1990 to 2005

	Prose	Document	Quantitative
(1) Weighted mean proficiency requirement for all occupations in 1990	284	279	284
(2) Weighted mean proficiency requirement for new jobs in high-growth occupations in 2005	301	294	297
(3) Difference in mean proficiency between new jobs in high-growth occupations in 2005 and all occupations in 1990	+17	+15	+13
(4) Weighted mean proficiency requirement for jobs in growth occupations in 2005	293	288	291
(5) Difference in mean proficiency between new jobs in growth occupations in 2005 and all occupations in 1990	+9	+8	+7
(6) Weighted mean proficiency requirement for lost jobs in declining occupations in 2005	252	249	258
(7) Difference in mean proficiency between new jobs in growth occupations and lost jobs in declining occupations in 2005	+40	+39	+33
(8) Weighted mean proficiency requirement for jobs in all occupations in 2005	286	281	285
(9) Difference in mean proficiency between jobs in 2005 and 1990	+2	+2	+2

Notes: (1) based on actual occupational employment distribution in 1990; (2) high-growth occupations are those projected to grow by at least 25% from 1990 to 2005; (3) mean score in #1 subtracted from mean in #2; (4) growth occupations are those projected to grow from 1990 to 2005; (5) mean in #1 subtracted from mean in #4; (6) declining occupations are those in which the number of jobs is projected to decrease from 1990 to 2005; (7) mean in #6 subtracted from mean in #4; (8) based on projected occupational employment distribution in 2005; (9) based on mean in #1 of actual 1990 jobs subtracted from mean in #8 of projected 2005 jobs. Subtraction results may differ from the numbers shown due to differences in rounding.

SOURCE: U.S. Department of Education, National Center for Education Statistics, National Adult Literacy Survey, 1992; and U.S. Bureau of Labor Statistics and 2005. Although only a small share of the American work force (less than 1 percent) would be affected by job losses in these declining occupations, the large performance gaps suggest potentially severe mismatches between their existing literacy skills and the literacy requirements of growth occupations.

While the changing occupational composition of new jobs in the United States economy will raise average literacy requirements over the next decade, estimates of the net impact of the changing mix of jobs on overall literacy requirements must take into consideration the entire set of jobs that will likely exist in the year 2005. The 24.6 million net new jobs expected to be created between 1990 and 2005 represent only one-sixth of the jobs that will be held by American workers at the end of this period.[31] The mean required proficiencies of this projected set of 147.2 million jobs will range from 281 on the document scale to 285 on the quantitative scale and 286 on the prose scale. These mean scores are roughly equivalent to those existing in 1990, indicating that no substantial gains in proficiencies would be required to meet future targets. Unless substantive upgrading of literacy-related skills occurs within occupations, these data provide little evidence of a major skills mismatch due to higher literacy requirements in future jobs.

While the above sections of this report have assessed likely changes in literacy requirements due to a projected shift in the occupational mix of jobs in the United States, shifts in the demographic composition of the work force also will occur over the next 10 years and could cause skills imbalances from the supply side. The 1992 cohort of 55- to 64-year-olds will be withdrawing from active labor force participation, while the nation's 16- to 24-year-olds will enter adult labor markets in greater numbers.[32] This trend should be accompanied by rising average literacy proficiencies. Employed adults age 55 to 64 had low mean scores on each literacy scale in 1992 (Table 3.15). Although full-time employees age 16 to 24 did not perform as well as those age 25 to 54, their skills should improve across time for at least three reasons. First, young full-time workers will be joined by many of their young counterparts who were working part time in 1992 — individuals who had relatively high mean scores on each literacy scale. Second, the scores of the youngest adults should improve as they mature and complete more years of formal schooling.[33] Third, many teens and young adults with strong proficiencies were still enrolled in school and unattached to the labor market at the time of the National Adult Literacy Survey. The size of the existing score gaps between employed 16- to 24-year-olds and 25- to 54-year-olds should therefore narrow in the coming decade.

To compare the mean literacy scores of employed 25- to 64-year-olds in 1992 with the likely mean scores of employed adults in this age group a decade

Table 3.15—Mean literacy proficiencies of the full-time and part-time employed, by age group: 1992

Literacy scale/ age group	Mean proficiency Employed full time	 Employed part time
Prose		
16 to 24	280	289
25 to 34	290	285
35 to 44	297	294
45 to 54	292	284
55 to 64	270	271
Document		
16 to 24	281	288
25 to 34	290	280
35 to 44	293	285
45 to 54	283	271
55 to 64	261	257
Quantitative		
16 to 24	279	285
25 to 34	292	279
35 to 44	299	288
45 to 54	294	279
55 to 64	274	270

SOURCE: U.S. Department of Education, National Center for Education Statistics, National Adult Literacy Survey, 1992.

hence, the authors generated weighted proficiencies for employed adults age 16 to 54 in 1992 and assumed that each age group would maintain its existing proficiencies over the following decade (Table 3.16). For the 16- to 24-year-old cohort, this is clearly a conservative assumption since the mean scores of employed adults in this age group will rise as they mature, enter the labor force in greater numbers, and complete more years of school.[34] As the findings in Table 3.17 reveal, controlling for years of schooling completed, the mean scores of full-time and part-time employees age 16 to 24 either match or exceed those of employees age 25 to 34 in each educational attainment group, with the exception of those holding a two- or four-year degree.

The projected mean literacy scores of employed adults age 25 to 64 in the year 2002 are 287 on the document scale (2.4 points higher than that of the

Table 3.16—Mean literacy proficiencies of employed adults age 25 to 64: 1992 and 2002

Year	Mean proficiency Prose	 Document	 Quantitative
1992 (actual)	290	285	291
2002 (projected)	291	287	291
Difference in mean proficiency between 2002 and 1992	+1	+2	0

Notes: Each age group was weighted by its share of the employed 25- to 64-year -old population in each time period.

SOURCE: U.S. Department of Education, National Center for Education Statistics, National Adult Literacy Survey, 1992; and U.S. Bureau of Labor Statistics.

Table 3.17—Mean literacy proficiencies of employed adults age 16 to 24 and age 25 to 34, by educational attainment and employment status: 1992

Literacy scale/ highest level of education attained	Mean proficiency Employed full time 16 to 24	 25 to 34	 Diff.	 Employed part time 16 to 24	 25 to 34	 Diff.
Prose						
9 to 12 years, no diploma	246	240	+6	275	236	+40
High-school diploma or GED	273	274	-1	283	275	+8
Some postsecondary	300	297	+4	312	302	+10
Two-year degree or higher	326	332	-6	329	335	-7
Document						
9 to 12 years, no diploma	247	243	+4	277	233	+44
High-school diploma or GED	276	274	+2	281	271	+10
Some postsecondary	302	298	+3	311	298	+13
Two-year degree or higher	323	328	-5	321	326	-5
Quantitative						
9 to 12 years, no diploma	245	243	+2	274	229	+45
High-school diploma or GED	275	277	-2	275	270	+5
Some postsecondary	300	300	0	308	299	+9
Two-year degree or higher	320	331	-11	321	324	-3

Note: The absolute differences presented in this table were calculated before rounding the mean proficiencies for the subgroups.

SOURCE: U.S. Department of Education, National Center for Education Statistics, National Adult Literacy Survey, 1992.

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1992 cohort), 291 on the prose scale (about 1 point higher than 1992), and 291 on the quantitative scale (identical to 1992).

Overall, these findings suggest that, in the absence of accelerated growth in the demand for high-level white-collar workers or a sustained rise in literacy requirements for front-line white- and blue-collar workers, future literacy requirements for jobs in the United States will, on average, be roughly matched by the literacy proficiencies of the future adult labor force. Continued high rates of immigration among poorly educated persons with limited English-speaking abilities could contribute to a growing skills mismatch, however, as would any deterioration in the literacy proficiencies of the forthcoming cohort of young adults.

At the time of the 1992 National Adult Literacy Survey, the national labor market had been characterized by slow job growth, excess unemployment, a high level of part-time employment due to an undersupply of full-time jobs, and rising underemployment among recent college graduates. In this labor market context, there did not appear to be, in the aggregate, a major mismatch between employees' literacy skills and employers' demands. Accordingly, this should not be blamed for many of the nation's recent labor market problems in the early 1990s. Underutilization of existing skills and abilities appeared to be surfacing in a growing number of the nation's labor market areas, reflecting weak growth in jobs overall and actual declines in management and defense-related positions in the early 1990s. As Dana Milbank noted in a Wall Street Journal article on the job duties and working conditions of telephone sales representatives, "Restless in their careers, telemarketers here, as elsewhere, feel capable of more than their work allows them to do. And that inevitably creates tension between the desire for something better and the strong suspicion that they will never get it."[35]

Endnotes

1. See: Joseph H. Boyett and Henry P. Conn, *Workplace 2000: The Revolution Shaping American Business*, Penguin Books, New York, 1992, p. 266.

2. Respondents were asked to identify the business or industry and the type of occupation in which they were currently working or had most recently worked. This information was used to create industry and occupation categories, based on the coding system used by the U.S. Census Bureau in conducting the 1980 decennial Census. For persons holding two or more jobs, only the industry and occupation of the job that accounted for the greatest number of hours worked during the reference week was coded. See: U.S. Bureau of the Census, *Classified Index of Industries and Occupations, First Edition*, U.S. Government Printing Office, Washington, D.C., 1980.

3. The occupational employment projections of the U.S. Bureau of Labor Statistics for 1990 to 2005 were used in conducting this analysis. See: U.S. Bureau of Labor Statistics, *Outlook 1990-2005, BLS Bulletin 2402*, U.S. Government Printing Office, Washington, D.C., 1992.

4. These eight industry groups reflect standard industry employent classifications used by the U.S. Bureau of Labor Statistics. Retail and wholesale trade industries were merged into one trade sector, as were mining and construction industries, given the relatively small number of observations for workers in mining industries. The U.S. Bureau of Labor Statistics estimated that in 1992 there were only 635,000 wage and salary workers in the nation's mining industries, accounting for only .6 percent of all wage and salary workers in all nonagricultural industries. See: U.S. Bureau of Labor Statistics, *Employment and Earnings*, January 1993, "Table B-1", p. 85.

5. The mean scores of workers in the finance, insurance, and real estate sector and the public administration sector were statistically identical on each of the three scales. The public administration sector encompasses federal, state, and local government employees who work for executive, legislative, and judicial departments and administrative agencies performing uniquely government functions (e.g., defense, fire, police, post office, environmental, tax assessment and collection). It does not include all government workers. Other government workers are classified in the industries in which they work (e.g., construction, manufacturing, or services).

6. The standard deviations of the scores for workers in the finance, insurance, and real estate sector were equal to 48 points on the prose and document scales and 52 points on the quantitative scale.

7. The services sector includes a heterogeneous array of industries with widely varying occupational staffing patterns. For example, in the professional services industries (education, engineering services, health, legal), nearly six of every 10 workers held a professional, management, or technical job. See: U.S. Bureau of Labor Statistics, *Employment and Earnings*, January 1993, Table 25, p. 203.

8. High-level sales positions include sales representatives, sale supervisors, and proprietors, which together accounted for 7.7 million workers in 1992. This group was one of the fastest growing occupational clusters in the country in the 1980s.

9. In 1992, only 2 percent of all workers in the nation's trade industries and 3 percent of those in mining and construction were professionals.

10. There were no significant differences in prose, document, or quantitative proficiencies among front-line workers in these other four industrial sectors. The mean document score of blue collar workers in trade industries was 9 points higher than that of such workers in manufacturing industries, but this was not quite statistically significant at the .05 level. The 9-point difference between the mean quantitative scores of blue collar workers in mining/construction and manufacturing industries was also not significant at the .05 level using the Bonferroni adjustment procedure.

11. Between 1989 and 1992, the number of employed health professionals rose by 335,000, accounting for 40 percent of the net increase in professional employment. Health service workers (nurse aides, orderlies, dental assistants) increased by 63,000, representing 12 percent of the net change in the number of employed service workers. The total number of newly employed health professionals, health technicians, and health service workers was 639,000; thus, employment growth in these health-related clusters was larger than net growth in total employment from 1989 to 1992.

12. Because individuals were classified by occupation based on their current or most recent job, the weighted number of employed individuals in these

occupational analyses is slightly greater than 147 million, or 28 million more than the number of persons actively employed at the time of the survey.

13. Under the moderate growth path scenario, the Bureau of Labor Statistics projects that total employment in the United States will increase by 20 percent. Projected growth rates for professional, managerial, and technical occupations are 32 percent, 27 percent, and 37 percent, respectively. See: George Silvestri and John Lukasiewicz, "Occupational Employment Projections," in *Outlook 1990-2005, BLS Bulletin 2402*, p. 63.

14. Within each major occupational group there are some occupations with higher than average educational attainments, literacy proficiencies, and weekly earnings; however, this analysis uses the average for the entire group of occupations.

15. See: (i) The Commission on the Skills of the American Workforce; *America's Choice: High Skills or Low Wages!*; (ii) Peter B. Doeringer, et al., *Turbulence in the American Workplace* . . .; (iii) Ray Marshall and Marc Tucker, *Thinking for a Living* . . .

16. See: C. Fred Bergsten, *America in the World Economy: A Strategy for the 1990s*, Institute for International Economics, Washington, D.C., 1988.

17. Ana Puga, "Manufacturing Job Training Urged", *The Boston Globe*, July 13, 1993.

18. These data are from a Job Training Supplement to the January 1991 Current Population Survey. Responses on reading, writing, and math training were tabulated by research staff at the Center for Labor Market Studies of Northeastern University using public-use data tapes from the U.S. Census Bureau.

19. See: Max L. Carey and James C. Franklin, "Industry Output and Job Growth Continues Slow into Next Century", in *Outlook 1990-2005, BLS Bulletin 2402*, U.S. Government Printing Office, Washington, D.C., pp. 43-61.

20. Employment projections are based on the moderate growth scenario of the U.S. Bureau of Labor Statistics. The projections were made in 1992 before President Clinton's health reform proposals were introduced before the U.S. Congress.

21. The 1990 employment estimates include self-employed workers. See: George Silvestri and John Lukasiewicz, op. cit., "Table 2", pp. 66-78.

22. Ibid, "Table 11", p. 88.

23. See: U.S. Bureau of Labor Statistics, *Outlook 1990-2005, BLS Bulletin 2402*, U.S. Government Printing Office, Washington, D.C., 1992.

24. For a review of the projected macroeconomic performance of the national economy under each of these alternative scenarios, see: Norman C. Saunders, "The U.S. Economy into the 21st Century", in *Outlook 1990-2005*, pp. 11-28.

25. The projected increase in craft employment is slightly less than 13 percent; however, employment of assemblers, fabricators, and operators, laborers and helpers, and farm/forestry/fishing workers is expected to grow by only 4 percent from 1990 to 2005. See: George Silvestri and John Lukasiewicz, op. cit., p. 63.

26. See: (i) John H. Bishop and Shani Carter, "How Accurate Are Recent BLS Occupational Projections?", *Monthly Labor Review*, October 1991, pp. 37-43; (ii) John H. Bishop and Shani Carter, "The Worsening Shortage of College Graduate Workers," Center for Advanced Human Resource Studies, New York State School of Industrial and Labor Relations, Cornell University, Ithaca, 1990.

27. See: (i) Patricia M. Flynn, *Facilitating Technological Change; The Human Resource Challenge*, Ballinger Publishing Company, Cambridge, 1988; (ii) David R. Howell and Edward N. Wolff, "Skill Changes in the U.S. Labor Force, 1960-1985," *Industrial and Labor Relations Review*, Vol. 44, April 1991, pp. 486-502.

28. See: (i) Thomas Bailey, *Education and the Transformation of Markets and Technology in the Textile Industry*, Technical Paper, No. 2, National Center on Education and Employment, Teachers College, Columbia University, New York, 1988; (ii) Peter Cappelli, "Are Skill Requirements Rising? Evidence from Production and Clerical Jobs," *Industrial and Labor Relations Review*, Vol. 46, No. 3, April 1993, pp. 515-530.

29. See: The Commission on the Skills of the American Work Force, *America's Choice: High Skills or Low Wages!*, especially pp. 23-29.

30. Each occupational cluster was weighted by its share of total employment in 1990. To estimate the required mean proficiencies of jobs in the year 2005, each occupational cluster was weighted by its share of projected employment in 2005.

31. Under the moderate growth path scenario, there will be 147.2 million employed persons in the U.S. in the year 2005. See: George Silvestri and John Lukasiewicz, op. cit., p. 66.

32. The annual average civilian labor force participation rate of 55- to 64-year-olds in the United States in 1992 was 56 percent versus only 16 percent for 65- to 74-year-olds. See: U.S. Bureau of Labor Statistics, *Employment and Earnings*, January 1993, "Table 3," p. 174.

33. The national longitudinal survey of high-school sophomores from the class of 1980 found that their vocabulary, reading, mathematics, and science skills improved as they grew older. See: Donald A. Rock, et al., *Study of Excellence in High School Education, Longitudinal Study, 1980-82, Final Report*, Educational Testing Service, Princeton, New Jersey, 1985.

34. At the same time, the assumption that the mean scores of employed 45- to 54-year-olds will stay constant over the next decade is likely to be overly optimistic, given indirect evidence of fade effects in National Adult Literacy Survey scores from aging. A cross-sectional multiple regression analysis of the scores of all 16- to 65-year-olds revealed that those age 55 to 64 scored 8 to 16 points below those of the base group (age 16 to 24) on each literacy scale, controlling for gender, race/ethnicity, educational attainment, English-speaking ability, marital status, disability status, nativity status, and region of residence.

35. See: Dana Milbank, "Telephone Sales Reps Do Unrewarding Jobs that Few Can Abide," *The Wall Street Journal*, September 9, 1993, pp. A-1, A-10.

APPENDIX 3A

Methods Used to Define the Occupational Subgroups

National Adult Literacy Survey participants were asked three background questions on the nature of their current or most recent jobs. These questions asked respondents to identify:

- the business or industry in which they worked (i.e., fabricated metals manufacturing, retail shoe store, state labor department, farm)

- their occupation or job title (i.e., electrical engineer, stock clerk, typist, farmer)

- the most important activities or duties at the job (i.e., typing, keeping account books, filing, selling cars, finishing concrete)

Research staff at Educational Testing Service reviewed the information on job titles and duties and assigned each job an occupational code from the Census Bureau's Classified Index of Industries and Occupations. Based on these codes, jobs were combined into 11 major occupational groups and then into 32 detailed subgroups. The mean prose, document, and quantitative proficiencies of workers in each subgroup were estimated.

To assess the literacy requirements of projected changes in the occupational employment structure of the United States economy, the authors used industry and occupational employment projections from the U.S. Bureau of Labor Statistics for the 1990-2005 period.[A1] First, however, it was necessary to match the 32 occupational subgroups examined in the National Adult Literacy Survey to the more than 500 occupations examined by the Bureau of Labor Statistics.[A2] The resulting occupational matches and the closeness of their fit are displayed in Table 3A.1. In general, the 32 National Adult Literacy Survey occupational subgroups are well matched to the Bureau of Labor Statistics groups. In 28 of the 32 cases, the match is perfect or nearly perfect. In three of the remaining four cases (public sector executives and managers, private sector executives and managers, sales representatives, and sales supervisors), the National Adult Literacy Survey categories are somewhat broader than the Bureau of Labor Statistics groups. In future explorations of the literacy survey data, researchers may wish to further disaggregate the occupational employment categories where sample sizes are sufficient to conduct a more detailed occupational analysis.

The absolute and relative amount of dispersion in literacy scores also tended to vary considerably by occupational group (Table 3A.2). For example, the standard deviations of prose scores were lowest among professionals and administrative support workers (45 points) and highest among assemblers and fabricators (66 points), and farm, forestry, and fishing workers (72 points). Given that the latter two groups were also characterized by the lowest mean scores, their coefficients of variation (the standard deviation divided by the mean) were nearly twice as high as those of professionals, executives, technical workers, and administrative support employees. Similar patterns of dispersion by major occupational group also appear on the document and quantitative scales.

One reason for the high variance in scores for assemblers and fabricators and for farm, forestry, and fishing workers is related to the skills mix of jobs in these occupational groups. For example, employees in farm, forestry, and fishing occupations include farm owners and managers and captains of fishing vessels as well as farm laborers and members of fishing crews. The assemblers, fabricators, and operatives group encompasses numerical control machine operators, typesetters, and lithographers as well as laundry machine operators, grinders, and sewing machine operators. For many farm, laborer, and semi-skilled operative positions, formal education and literacy proficiencies are seldom used as part of the hiring and selection process. Furthermore, immigrants with limited formal schooling and English-speaking proficiencies frequently work in these types of jobs, generating a greater dispersion in literacy proficiencies.

Endnotes

A1. U.S. Bureau of Labor Statistics, *Outlook 1990-2005, BLS Bulletin 2402*, U.S. Government Printing Office, Washington, D.C., May 1992.

A2. See: George Silvestri and John Lukasiewicz, "Occupational Employment Projections," in *Outlook 1990-2005*, pp. 62-92.

Table 3A.1—Matching the National Adult Literacy Survey occupational employment subgroups with the Bureau of Labor Statistics occupational employment groups

Code	NALS occupational subgroups*	Corresponding BLS occupational groups	Closeness of match
01	Engineers	Engineers	Perfect match
02	Math Scientists, Computer Scientists, Other Natural Scientists	Life Scientists, Computer, Mathematical Analysts, Physical Scientists	Perfect match
03	Registered Nurses	Registered Nurses	Perfect match
04	Health Diagnostic/Other Health Assessment and Treating	Health Diagnosing, Assessment, and Treating Occupations	Perfect match
05	Accountants, Auditors	Accountants, Auditors	Perfect match
06	Public Sector Executives and Managers	Education Administrators, Government Chief Executives, Legislators	BLS definition less inclusive; public sector and protective service administrators not included
07	Private Sector Executives and Managers	Financial Managers, Funeral Directors, Marketing and Public Relations Managers, Personnel and Labor Relations Managers, Purchasing Managers	BLS definition less inclusive
08	All Other Management and Management Support	Other Managerial and Administrative Occupations, All Management Support Except Accountants and Auditors	BLS definition more inclusive
09	Teachers	Teachers and Instructors (Preschool to College/University)	Perfect match
10	Other Professional Workers	Social Scientists, Social and Recreational Workers, Religious Workers, Lawyers and Judges, Librarians and Counselors, Writers, Artists, and Entertainers, All Other Professional Workers	Perfect match

Table 3A.1—continued

Code	NALS occupational subgroups*	Corresponding BLS occupational groups	Closeness of match
11	Engineering and Science Technicians	Engineering and Science Technicians and Technologists	Perfect match
12	Health and Other Technicians	Health Technicians and Technologists, All Other Technicians	Perfect match
13	Sales Representatives and Supervisors	Insurance Sales, Real Estate Agents, Brokers and Appraisers, Securities and Financial Services Workers	BLS definition less inclusive; sales supervisors and proprietors not included
14	All Other Sales	Cashiers, Counter and Retail Clerks, Stock Clerks, Travel Agents, All Other Sales	Near perfect match
15	Adjusters, Investigators	Adjusters, Investigators, Collectors	Perfect match
16	Information Clerks	Information Clerks	Perfect match
17	Secretaries	Secretaries	Perfect match
18	Stenographers, Typists	Stenographers, Typists, Word Processors	Perfect match
19	Office Supervisors and Managers	Clerical Supervisors and Managers	Perfect match
20	All Other Administrative Support	Computer and Peripheral Equipment Operators, Communications Equipment Operators, Financial Records Processing, Mail Clerks and Messengers, Postal Clerks and Mail Carriers, Material Recording and Scheduling, Records Processing, Other Clerical and Administrative Support	Perfect match
21	Construction Crafts	Construction Trades	Perfect match

Table 3A.1—continued

Code	NALS occupational subgroups*	Corresponding BLS occupational groups	Closeness of match
22	Other Craft Workers	Blue Collar Worker Supervisors, Extractive and Related Workers, Mechanics, Installers, Repairers, Precision Production Occupations	Perfect match
23	Transport Operatives	Transportation and Material Moving Machine and Vehicle Operators	Perfect match
24	Fabricators, Assemblers, Hand Workers, Inspectors, Testers	Hand Workers, Including Assemblers and Fabricators, Inspectors, Testers, Graders	Perfect match
25	All Other Fabricators, Assemblers, Operators	Machine Setters, Set Up Operators, Tenders, Printing and Binding Workers, Textile and Related Operatives, Woodworking Machine Operators, All Other Machine Operators	Near perfect match
26	Cleaning Equipment, Handlers, Helpers, Laborers	Helpers, Laborers, Hand Material Movers	Perfect match
27	Personal Service Occupations	Personal Service	Perfect match
28	Public Safety Occupations, Except Guards and Other Private Security	Firefighting, Law Enforcement	Perfect match
29	Health Services	Health Service Occupations	Near perfect match
30	All Other Services	Cleaning and Building Service, Food Preparation and Service, Other Protective Service, All Other Services	Perfect match
31	Farm, Fishing, and Forestry Managers and Operators	Farm Operators and Managers, Fishing Captains and Other Officers, Supervisors of Farm, Fishing, and Forestry Workers	Near perfect match
32	All Other Farm, Forestry, and Fishing Workers	Animal Caretakers, Farm Occupations, Fishers, Hunters, Trappers, Forestry, Logging, Gardeners, Groundskeepers, All Other Farm and Forestry Workers	Near perfect match

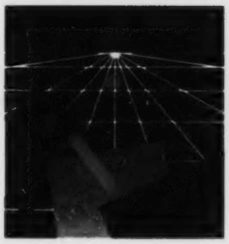
* To be included in this table, an occupational subgroup had to have at least 100 sample observations.

Table 3A.2—Estimated standard deviations and coefficients of variation in employees' literacy proficiencies, by major occupational group: 1992

	Prose		Document		Quantitative	
Occupational group	**sd**	**cv**	**sd**	**cv**	**sd**	**cv**
Professional	45.3	13.8	46.4	14.5	48.7	14.9
Executive, manager, administrator	49.2	15.4	49.5	16.0	50.9	15.8
Technical	46.4	15.1	48.3	15.7	50.6	16.4
Administrative support	44.9	15.2	46.1	15.9	47.3	16.1
Sales	51.4	17.8	51.1	18.0	54.0	18.6
Craft, precision production	58.3	21.8	59.4	22.3	61.2	22.3
Transport operative	58.9	22.8	59.9	23.0	61.0	22.9
Services	60.0	22.9	61.1	23.6	63.2	24.5
Farm, forestry, fishing	72.4	29.6	71.6	29.2	79.5	31.3
Laborer, helper, cleaner	62.4	25.2	63.6	25.7	66.4	26.6
Assembler, fabricator, operator	66.4	26.9	66.6	28.1	69.9	28.2

Notes: sd = standard deviation. cv = coefficient of variation. Coefficients of variation are in percents.

SOURCE: U.S. Department of Education, National Center for Education Statistics, National Adult Literacy Survey, 1992.



CHAPTER FOUR

Literacy Proficiencies and Earnings

In exploring the influence of literacy proficiencies on adults' labor market experiences, a central issue is that of identifying the extent to which the earnings of employed adults are related to their literacy skills. That is, do workers with higher literacy proficiencies earn higher weekly and annual wages than those with more limited proficiencies? If so, how strong are these associations? Do they hold true for most key demographic and socioeconomic subgroups of the labor force, or only for selected subgroups? These questions and others are explored in this chapter.

Literacy Proficiencies and Weekly Earnings of the Full-time Employed

The National Adult Literacy Survey background questionnaire asked respondents to indicate the number of hours worked in the week before the survey and their weekly wages that week.[1] Responses were used to calculate the weekly earnings of adults employed full time (i.e., 35 hours or more per week) when the survey was conducted.

Full-time employees for whom positive earnings data were available had estimated mean weekly earnings of $546 with a standard error of approximately $6 (Table 4.1, Figure 4.1).[2] A clear, positive relationship exists between workers' literacy and numeracy proficiencies and their weekly earnings. On each literacy scale, the mean weekly earnings of full-time workers rise continuously and substantially across the literacy levels. For example, those who performed in the lowest level of prose literacy had mean weekly earnings of $355. The weekly earnings figure rises to $531 for those who scored in the Level 3 range on this scale and to $910 for those who performed in Level 5. Thus, the mean weekly earnings of full-time workers in the third level of prose literacy were 50 percent higher than those of their counterparts in Level 1, and employees in the highest level of prose literacy outearned their counterparts in Level 3 by nearly 72 percent.

Similarly, on the document and quantitative scales, the higher one's proficiencies, the higher one's mean weekly earnings.[3] Once again, mean

Table 4.1—Mean weekly earnings of the full-time employed, by literacy level: 1992

Literacy scale/ level	Mean weekly earnings
Prose	
All	$546 (6.5)
Level 1	355 (8.2)
Level 2	436 (9.1)
Level 3	531 (7.9)
Level 4	709 (12.8)
Level 5	910 (34.7)
Document	
All	546 (6.5)
Level 1	355 (7.1)
Level 2	458 (8.5)
Level 3	553 (7.7)
Level 4	710 (12.1)
Level 5	807 (33.1)
Quantitative	
All	546 (6.5)
Level 1	330 (7.8)
Level 2	438 (10.6)
Level 3	533 (9.4)
Level 4	684 (11.2)
Level 5	913 (31.3)

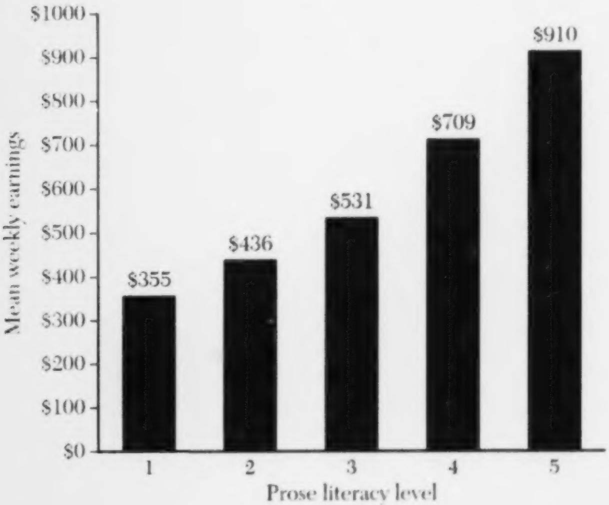
Note: Mean weekly wages were calculated only for those workers who reported wages greater than $0 and less than $5,000. Numbers in parentheses are standard errors.

SOURCE: U.S. Department of Education, National Center for Education Statistics, National Adult Literacy Survey, 1992.

weekly earnings differ substantially across the levels. Interestingly, however, full-time workers who scored in the highest level of document literacy had lower mean earnings ($807) than those who performed in the highest level on the other two scales ($910 for the prose scale; $913 for the quantitative scale).

To a large extent, the weekly earnings advantages of workers with strong literacy proficiencies were attributable to their far greater access to the more economically remunerative, higher-level white-collar occupations. Mean weekly earnings varied widely across major occupational groups (Table 4.2). Weekly earnings were highest for managers and executives ($936) and

Figure 4.1—Mean weekly earnings of the full-time employed, by prose literacy level: 1992



SOURCE: U.S. Department of Education, National Center for Education Statistics, National Adult Literacy Survey, 1992.

professionals ($798) and lowest for service workers ($335) and for laborers, helpers, and cleaners ($330). The mean weekly earnings of managers and executives were significantly higher than those of all other occupational subgroups, and professional workers outearned the employed in all of the remaining subgroups. As seen in the previous chapter, the service and laborer/helper occupations contained relatively high numbers of adults with low literacy scores. Weekly earnings are also positively associated with literacy proficiencies within most major occupational groups, reflecting a tendency for the more proficient to be in higher paying jobs and for more literate workers to have higher productivity.[4]

Table 4.2—Mean weekly earnings of the full-time employed by major occupational group: 1992

Occupational group	Mean weekly earnings
Managers, executives, administrators	$936 (22)
Professional	798 (14)
Sales	585 (22)
Technical	533 (19)
Craft workers	531 (12)
Transport operatives	507 (26)
Administrative support	409 (6)
Assemblers, fabricators, operators	394 (11)
Farm, forestry, fishing	364 (23)
Services	335 (8)
Laborers, helpers, cleaners	330 (8)

Note: Numbers in parentheses are standard errors.

SOURCE: U.S. Department of Education, National Center for Education Statistics, National Adult Literacy Survey, 1992.

Literacy Proficiencies and Weekly Earnings of Demographic Subgroups

For most demographic subgroups of the full-time employed, weekly earnings rise steadily across the literacy levels (Table 4.3).[5] The absolute and relative sizes of these earnings increases did vary by subgroup, however. In general, weekly earnings differences across the literacy levels were smallest for the youngest full-time employees (those age 16 to 24) and for individuals who had not earned a high-school diploma. For example, among young full-time workers, the only statistically significant weekly earnings difference on the prose scale was between workers in Levels 3 and 4 and those in Level 1. None of the other observed differences among young workers on the prose scale was statistically significant.

For both men and women, mean weekly earnings rose continuously and substantially as their proficiency increased on each of the three scales. On the prose scale, for example, the mean weekly earnings of men who scored in Level 3 were 59 percent higher than those of men who scored in Level 1. Among women, the relative size of the weekly earnings differential between full-time workers in Levels 1 and 3 on this scale was 51 percent.

Table 4.3—Mean weekly earnings of the full-time employed, by literacy level: total and by sex, race/ethnicity, age, and educational attainment: 1992

	Mean weekly earnings of the full-time employed in level...					
Literacy scale/group	**1**	**2**	**3**	**4**	**5**	**All**
Prose						
All	$355	$436	$531	$709	$910	$546
Sex						
Male	391	507	623	830	1,041	629
Female	272	336	411	548	716	428
Race/ethnicity						
White	408	445	539	712	927	582
Black	333	389	501	679	——	429
Hispanic	302	431	436	679	——	400
Mexican	291	363	401	660	——	354
Other	325	480	459	620	——	442
Asian/Pacific Islander	391	596	702	——	——	564
Age group						
16 to 24	260	292	300	341	——	300
25 to 34	333	418	477	616	690	490
35 to 44	380	478	577	769	1,018	622
45 to 54	390	492	646	894	1,141	671
55 to 64	427	529	690	828	——	612
65 and older	304	377	595	——	——	450
Educational attainment						
0 to 8 years	298	351	——	——	——	313
9 to 12 years	364	357	414	——	——	373
GED	333	364	489	529	——	431
High-school diploma	369	420	436	493	——	430
Some postsecondary	367	455	491	597	——	509
Two-year degree	386	504	578	610	630	574
Four-year degree or higher	586	677	739	866	993	830

Note: —— indicates that the number of cases is too small to provide reliable estimates.

SOURCE: U.S. Department of Education, National Center for Education Statistics, National Adult Literacy Survey, 1992.

Table 4.3.—continued

Literacy scale/group	Mean weekly earnings of the full-time employed in level... 1	2	3	4	5	All
Document						
All	$355	$458	$553	$710	$807	$546
Sex						
Male	390	531	650	814	909	629
Female	288	362	427	557	615	428
Race/ethnicity						
White	388	477	560	718	817	582
Black	354	402	505	668	——	425
Hispanic	317	402	502	550	——	400
Mexican	291	354	459	568	——	354
Other	369	444	502	502	——	442
Asian/Pacific Islander	353	539	704	729	——	564
Age group						
16 to 24	261	276	306	343	——	300
25 to 34	322	431	485	615	616	490
35 to 44	378	484	622	775	939	662
45 to 54	393	524	698	919	1,154	671
55 to 64	424	569	685	935	——	612
65 and older	318	476	——	——	——	450
Educational attainment						
0 to 8 years	297	371	——	——	——	313
9 to 12 years	342	419	337	——	——	373
GED	364	372	492	532	——	431
High-school diploma	371	420	441	489	——	430
Some postsecondary	368	461	510	588	480	509
Two-year degree	443	534	583	600	568	574
Four-year degree	632	717	787	878	904	830

Note: —— indicates that the number of cases is too small to provide reliable estimates.

SOURCE: U.S. Department of Education, National Center for Education Statistics, National Adult Literacy Survey, 1992.

Table 4.3.—continued

Literacy scale/group	Mean weekly earnings of the full-time employed in level... 1	2	3	4	5	All
Quantitative						
All	$330	$438	$533	$684	$913	$546
Sex						
Male	354	508	614	782	1,012	629
Female	285	355	427	528	689	428
Race/ethnicity						
White	353	448	540	684	926	582
Black	329	413	528	663	——	425
Hispanic	308	424	439	648	——	400
Mexican	280	397	430	504	——	354
Other	362	445	447	663	——	442
Asian/Pacific Islander	319	426	668	830	——	564
Age group						
16 to 24	253	283	311	328	——	300
25 to 34	308	414	499	579	701	490
35 to 44	343	478	582	746	1,007	622
45 to 54	386	487	648	842	1,177	671
55 to 64	366	542	681	843	——	612
65 and older	321	413	——	——	——	450
Educational attainment						
0 to 8 years	295	377	313	——	——	313
9 to 12 years	322	405	397	387	——	373
GED	278	377	509	435	——	431
High-school diploma	337	412	449	479	559	430
Some postsecondary	344	451	480	602	637	509
Two-year degree	396	469	577	616	654	574
Four-year degree	——	610	731	865	1,031	830

Note: —— indicates that the number of cases is too small to provide reliable estimates.

SOURCE: U.S. Department of Education, National Center for Education Statistics, National Adult Literacy Survey, 1992.

On average, however, the mean weekly earnings of women employed full time were only about two-thirds of men's earnings (Table 4.4). The ratios of female earnings to male earnings ranged from 66 to 80 percent across the five literacy levels on the prose and quantitative scales. The relative earnings ratios were actually higher for women who performed in the lowest literacy level than for those in Levels 3 to 5.

Table 4.4—Relative weekly earnings of the full-time employed by sex and race/ethnicity, by literacy level: 1992

	Results for level..					
Comparison group	**1**	**2**	**3**	**4**	**5**	**All**
Female employees' weekly earnings as a percentage of male employees' weekly earnings						
Prose	70	66	66	66	68	68
Quantitative	80	70	70	68	68	68
Black employees' weekly earnings as a percentage of White employees' weekly earnings						
Prose	82	87	93	95	—	73
Quantitative	93	92	98	97	—	73
Hispanic employees' weekly earnings as a percentage of White employees' weekly earnings						
Prose	74	97	81	95	—	69
Quantitative	87	95	81	95	—	69
Asian/Pacific Islander employees' weekly earnings as a percentage of White employees' weekly earnings						
Prose	96	134	130	—	—	97
Quantitative	90	95	123	121	—	97

Note: — indicates that the number of cases is too small to provide reliable estimates.

SOURCE: U.S. Department of Education, National Center for Education Statistics, National Adult Literacy Survey, 1992.

The mean weekly earnings of the full-time employed also varied widely by racial/ethnic group, ranging from a low of $354 for Mexican-Americans to a high of $582 for White non-Hispanics. For each racial/ethnic group, mean weekly earnings tended to rise across the levels on each literacy scale. Within each level except Level 1, Asian/Pacific Islanders either matched or had higher mean weekly earnings than Whites.

In the aggregate, the mean weekly earnings of Black full-time employees were $425, or only 73 percent of those of Whites. Within each literacy level, however, the weekly earnings of the Black full-time employed were a considerably higher percentage of those of Whites. Across the five quantitative levels, for example, the mean weekly earnings of Black workers were 92 to 98 percent of those of Whites. Similar findings apply to the earnings of Hispanic workers relative to those of Whites. For all full-time workers combined, the mean weekly earnings of Hispanic adults were only 69 percent of those of White adults. Yet, the mean earnings of Hispanic employees who performed in Levels 1 to 4 on the quantitative scale were 81 to 95 percent of those of White employees.

Overall, these analyses reveal that workers in each major racial/ethnic group tended to receive higher weekly earnings as their literacy levels increased. In each group and on each literacy scale, the mean weekly earnings of full-time workers who performed in Level 4 typically were twice as high as those of their counterparts who performed in Level 1. By simply controlling for one's level of prose, document, or quantitative literacy, the relative earnings differences between White workers and Black and Hispanic workers are diminished considerably though not fully. A more rigorous multivariate statistical analysis of the weekly and annual earnings of workers is presented in Chapter Seven. Findings of these analyses indicate that most racial/ethnic differences in earnings approximate zero after controlling for key human capital and demographic variables.

In each age group, the mean weekly earnings of full-time employees tend to rise with their levels of prose, document, and quantitative literacy. The size of the absolute and relative earnings differentials associated with higher proficiencies varied substantially by age group, however (Table 4.5). On the prose scale, the mean weekly earnings of the full-time employed in Level 3 exceeded the earnings of those in Level 1 by only 15 percent among 16- to 24-year-olds (a significant difference), by 43 percent among 25- to 34-year-olds, and by nearly 66 percent among those age 45 to 54. Similarly, the weekly earnings advantages of full-time workers who performed in Level 5 relative to those who scored in Level 3 are 44 percent for 25- to 34-year-olds, and 77 percent for the 35 to 44 and the 45 to 54 age groups. On the quantitative scale, the relative earnings differences also rise considerably with age. The size of the weekly earnings gaps between the more and less proficient tends to be quite large for workers age 45 to 54.

In sum, the earnings advantages associated with higher literacy proficiencies are considerably greater for older workers than for the youngest workers.[6] In recent decades, in fact, the earnings advantages of more mature workers have tended to increase among workers in the United States and in most West European nations as the real earnings of younger workers (especially males) have declined in absolute terms and relative to older workers.[7] The weaker relationships between the literacy levels and weekly earnings of younger workers are discussed in greater detail later in this chapter.

The final task in this section is to examine the relationships among educational attainments, weekly wages, and literacy proficiencies among the full-time employed. Not surprisingly, employees' wages vary considerably with their level of formal education. Those who had earned a four-year college degree or more advanced degree earned $830 per week, on average — a wage

Table 4.5—Relative weekly earnings of the full-time employed at selected levels on the prose and quantitative scales, by age group: 1992

Literacy scale/ age group	Level 3 earnings as a percent of Level 1 earnings	Level 5 earnings as a percent of Level 3 earnings
Prose		
16 to 24	115	—
25 to 34	143	145
35 to 44	152	177
45 to 54	166	177
55 to 64	162	—
Quantitative		
16 to 24	123	126
25 to 34	162	140
35 to 44	170	173
45 to 54	168	182
55 to 64	186	143

Note: — indicates that the number of cases is too small to provide reliable estimates.

SOURCE: U.S. Department of Education, National Center for Education Statistics, National Adult Literacy Survey, 1992.

level two or three times higher than that of workers with 12 or fewer years of schooling.

Regardless of their educational attainments, full-time workers' weekly wages tended to rise steadily with their level of literacy. Among those whose highest educational attainment was a high-school diploma, mean wages rose from $371 for those who scored in Level 1 on the document scale to $489 for those in Level 4, the highest level for which sufficient sample cases are available. Among those who had earned at least a bachelor's degree, mean weekly wages climbed from $610 for those who scored in Level 2 on the quantitative scale to $1,031 for those in Level 5.

A closer look at these data reveals that the earnings advantages associated with higher literacy proficiencies are greater for adults with higher levels of education than for those with more limited schooling. For example, among adults who had completed some secondary education without receiving a high-school diploma or GED, the mean weekly wages of individuals who performed in Level 3 on the prose scale ($414) were only 14 percent higher than those of their peers in Level 1 ($364). Among high-school graduates the relative earnings difference for the same two groups was 18 percent, and among those with a two-year degree it was nearly 50 percent.

Literacy Proficiencies and Annual Earnings

National Adult Literacy Survey respondents were asked to identify the number of weeks they had worked during the 12 months before the survey, the average number of hours they worked each week, and their average earnings per hour or week of employment. These data were combined to estimate their gross annual earnings (before taxes and other payroll deductions) from employment during the immediately preceding 12 months.

Clearly, workers' annual earnings are influenced jointly by their weeks of employment, hours of work per week, and hourly earnings. Persons with higher literacy proficiencies were more likely to be employed at any given time, were more likely to obtain full-time jobs, and were likely to have higher weekly earnings when they are employed.[8] Thus, one might well expect the annual earnings advantages of employed adults with high literacy proficiencies to be even larger than their weekly earnings advantages.[9]

The mean annual earnings of all respondents who had been employed at some point in the 12 months before the survey were $20,920, with a standard error of $210 (Table 4.6). On each literacy scale, mean annual earnings rise continuously and substantially across the levels, and the relative sizes of these increases are indeed somewhat greater than those for weekly earnings.[10] On the prose scale, for example, annual earnings rise from an average of $13,260 for those in Level 1 to $20,860 for those in Level 3 to $40,050 for those in Level 5. The mean annual earnings of workers who performed in the highest prose level were nearly twice as high as those of adults who performed in Level 3 and three times higher than those of respondents who scored in Level 1. The earnings differentials across the quantitative literacy levels were nearly identical to those on the prose scale. On the document scale, mean earnings also rise consistently and substantially across the levels; however, the annual

Table 4.6—Mean annual earnings of the employed, by literacy level: 1992

Literacy scale/ level	Mean annual earnings
Prose	
All	$20,920 ($210)
Level 1	13,260 (320)
Level 2	15,550 (300)
Level 3	20,860 (510)
Level 4	27,890 (530)
Level 5	40,050 (1,920)
Document	
All	20,920 (210)
Level 1	13,110 (310)
Level 2	17,110 (360)
Level 3	21,410 (490)
Level 4	28,610 (610)
Level 5	33,600 (1,710)
Quantitative	
All	20,920 (210)
Level 1	12,020 (250)
Level 2	15,560 (350)
Level 3	20,620 (460)
Level 4	28,610 (750)
Level 5	39,190 (1,610)

Note: Numbers in parentheses are standard errors.

SOURCE: U.S. Department of Education, National Center for Education Statistics, National Adult Literacy Survey, 1992.

earnings difference between those in Levels 4 and 5 on the document scale was not statistically significant. Similar to the findings for the weekly earnings variable, the annual earnings advantages of adults who scored in the highest level of document literacy are smaller than those of adults who performed in the highest level of prose and quantitative literacy.

Table 4.7 displays mean annual earnings by level of prose, document, and quantitative literacy for employed adults in subgroups defined by gender, race/ethnicity, age, and educational attainment. With only a few exceptions (primarily, persons without a high-school diploma or GED), annual earnings rise continuously across the literacy levels for each subgroup. The absolute and relative size of these differentials vary by subgroup, however.

For both men and women, annual earnings increase continuously and strongly with their literacy levels. Yet, while employed women and men have nearly identical average proficiencies, the mean annual earnings of women are only 58 percent of those of men, reflecting variations in annual hours worked as well as average hourly earnings (Table 4.8). Women's earnings as a percentage of men's tend to vary by literacy level and scale, but in no instance are women's earnings more than two-thirds those of men. The relative earnings position of women does not rise with their level of literacy. Instead, similar to the findings for weekly earnings, women's earnings position relative to that of men actually tends to decline slightly as higher proficiency levels are reached on both the prose and quantitative scales.

For all racial/ethnic groups, the annual earnings of employees tended to rise with their level of literacy. Mean annual earnings were highest for Asian/Pacific Islanders, followed by Whites. In nearly all levels of prose and quantitative literacy, the mean annual earnings of Asians/Pacific Islanders exceeded those of Whites.[11]

The mean annual earnings of Black workers as a whole were only 70 percent of those of White workers. When one compares the earnings of Black and White employees who performed in the same prose and quantitative literacy levels, however, the earnings differentials narrow considerably. For example, the mean annual earnings of Black workers in Level 1 on the prose scale were 82 percent of those of White workers in that level, while among those in Level 4, Black workers' earnings were 99 percent of those of White workers. On the quantitative scale, the mean earnings of Black workers were 90 percent to 99 percent of the earnings of Whites. Thus, Black and White workers with approximately equivalent prose and quantitative proficiencies (particularly in Level 4, the highest level for which data are available) had more similar earnings, controlling for just this one human capital variable.

Table 4.7—Mean annual earnings of the employed, by literacy level: total and by sex, race/ethnicity, age, and educational attainment: 1992

	Mean annual earnings of the employed in level...					
Literacy scale/group	**1**	**2**	**3**	**4**	**5**	**All**
Prose						
All	$13,260	$15,550	$20,850	$27,890	$40,050	$20,920
Sex						
Male	15,490	19,100	26,640	35,180	51,210	25,940
Female	9,100	11,500	14,880	19,890	26,790	15,120
Race/ethnicity						
White	15,250	15,760	21,180	27,890	40,620	22,320
Black	12,430	13,920	18,580	27,620	——	15,590
Hispanic						
Mexican	10,640	13,180	16,180	25,480	——	13,320
Cuban	11,110	14,590	38,230	——	——	19,520
Other	11,850	18,530	15,850	23,420	——	16,320
Asian/Pacific Islander	14,910	24,810	30,590	31,350	——	24,180
Age group						
16 to 24	7,100	7,610	7,810	8,430	9,510	7,820
25 to 34	13,160	15,890	19,540	25,010	30,760	19,630
35 to 44	15,450	19,350	24,510	33,040	43,510	26,000
45 to 54	16,550	20,200	29,390	41,400	53,550	29,870
55 to 64	16,750	22,200	28,680	32,510	——	25,280
65 and older	9,990	10,050	33,780	18,570	——	19,220
Educational attainment						
0 to 8 years	10,860	10,630	53,200	——	——	13,120
9 to 12 years	12,420	9,320	10,360	8,580	——	10,440
GED	14,350	14,800	15,300	16,380	——	15,070
High-school diploma	14,570	15,880	17,530	19,300	——	16,840
Some postsecondary	17,120	17,580	19,670	21,110	23,020	19,380
Two-year degree	15,630	19,090	21,630	22,640	21,580	21,410
Four-year degree or higher	21,020	30,000	32,630	37,200	46,360	36,370

Note: —— indicates that the number of cases is too small to provide reliable estimates.

SOURCE: U.S. Department of Education, National Center for Education Statistics, National Adult Literacy Survey, 1992.

Table 4.7—continued

	Mean annual earnings of the employed in level...					
Literacy scale/group	1	2	3	4	5	All
Document						
All	$13,110	$17,110	$21,410	$28,610	$33,600	$20,920
Sex						
Male	15,140	21,230	27,310	35,560	41,130	25,940
Female	9,890	12,610	15,260	20,310	23,150	15,120
Race/ethnicity						
White	14,140	17,690	21,690	28,950	33,970	22,330
Black	12,760	15,050	18,590	26,560	——	15,590
Hispanic						
Mexican	10,890	12,080	19,610	20,940	——	13,320
Cuban	11,650	14,330	37,220	——	——	19,520
Other	13,150	16,240	18,740	19,510	——	16,320
Asian/Pacific Islander	16,160	30,610	21,520	31,850	——	24,180
Age group						
16 to 24	7,070	7,290	7,750	9,090	9,490	7,820
25 to 34	12,740	16,110	19,830	25,690	27,100	19,630
35 to 44	15,060	20,320	26,270	33,040	41,730	26,000
45 to 54	16,710	22,150	31,770	43,610	49,650	29,870
55 to 64	17,150	22,800	30,040	36,750	——	25,280
65 and older	9,110	19,620	28,170	50,970	——	19,220
Educational attainment						
0 to 8 years	10,580	11,720	52,260	——	——	13,120
9 to 12 years	11,450	11,940	8,030	6,120	——	10,440
GED	15,030	13,820	16,600	15,870	——	15,070
High-school diploma	14,200	16,190	17,600	19,810	——	16,840
Some postsecondary	18,020	18,130	19,440	20,980	23,790	19,380
Two-year degree	17,400	20,890	21,400	22,330	19,960	21,410
Four-year degree or higher	22,950	32,880	33,950	38,970	40,080	36,370

Note: —— indicates that the number of cases is too small to provide reliable estimates.

SOURCE: U.S. Department of Education, National Center for Education Statistics, National Adult Literacy Survey, 1992.

Table 4.7—continued

Literacy scale/group	Mean annual earnings of the employed in level... 1	2	3	4	5	All
Quantitative						
All	$12,020	$15,560	$20,610	$28,610	$39,190	$20,920
Sex						
Male	13,880	19,240	25,270	35,450	46,080	25,940
Female	9,310	12,190	15,480	19,790	25,960	15,120
Race/ethnicity						
White	13,060	15,580	20,780	28,520	39,720	22,330
Black	11,690	15,420	20,140	26,800	——	15,590
Hispanic						
Mexican	10,300	13,790	15,420	28,220	——	13,320
Cuban	12,460	15,190	——	——	——	19,520
Other	12,330	15,620	17,570	27,510	——	16,320
Asian/Pacific Islander	13,150	24,180	26,200	33,610	——	24,180
Age group						
16 to 24	6,640	7,060	8,540	8,350	9,200	7,820
25 to 34	12,290	15,570	19,910	24,980	30,960	19,630
35 to 44	13,440	18,950	25,050	32,220	44,980	26,000
45 to 54	16,440	19,600	28,390	41,800	55,170	29,870
55 to 64	14,510	21,300	27,970	36,280	51,550	25,280
65 and older	10,100	18,360	19,740	36,120	——	19,220
Educational attainment						
0 to 8 years	10,610	11,370	11,750	——	——	13,120
9 to 12 years	10,430	10,940	10,390	8,460	——	10,440
GED	12,300	13,340	16,780	18,760	——	15,070
High-school diploma	13,350	15,140	17,990	20,350	27,880	16,840
Some postsecondary	14,220	17,070	18,730	23,550	23,620	19,380
Two-year degree	13,900	18,420	21,420	23,040	24,150	21,410
Four-year degree or higher	22,750	28,130	31,750	38,100	47,170	36,370

Note: —— indicates that the number of cases is too small to provide reliable estimates.

SOURCE: U.S. Department of Education, National Center for Education Statistics, National Adult Literacy Survey, 1992.

Table 4.8—Relative annual earnings of the employed by sex and race/ethnicity, by literacy level on the prose and quantitative scales: 1992

	Results for level...					
Comparison group	**1**	**2**	**3**	**4**	**5**	**All**
Female employees' annual earnings as a percentage of male employees' annual earnings						
Prose	59	60	56	57	52	58
Quantitative	67	63	61	56	56	58
Black employees' annual earnings as a percentage of White employees' annual earnings						
Prose	82	88	88	99	——	70
Quantitative	90	99	97	94	——	70
Mexican employees' annual earnings as a percentage of White employees' annual earnings						
Prose	70	84	76	91	——	60
Quantitative	79	89	74	99	——	60
Other Hispanic employees' annual earnings as a percentage of White employees' annual earnings						
Prose	78	118	75	84	——	73
Quantitative	94	100	85	96	——	73
Asian/Pacific Islander employees' annual earnings as a percentage of White employees' annual earnings						
Prose	98	157	144	112	——	108
Quantitative	101	155	126	118	——	108

Note: —— indicates that the number of cases is too small to provide reliable estimates.

SOURCE: U.S. Department of Education, National Center for Education Statistics, National Adult Literacy Survey, 1992.

Similar patterns prevailed for "other Hispanic" and Mexican workers. For example, the mean annual earnings of "other Hispanic" workers were, on average, only 73 percent of those of Whites. Yet, the earnings gaps between the two groups narrow considerably when only proficiency levels are taken into consideration. Within each level on the quantitative scale, the earnings of "other Hispanic" workers range from 85 percent to 100 percent of those of Whites. Efforts to reduce the fairly sizable literacy proficiency differentials between Whites and both Blacks and Hispanics, thus, appear to be a promising strategy for reducing the earnings differentials among these groups.

Within each age group, the mean annual earnings of the employed rise continuously with their level of literacy proficiency, but the size of the earnings gaps between the more and less proficient vary widely by age group (Table 4.9). On the prose scale, the relative earnings advantages of employees in Level 3 compared with those in Level 1 range from just 10 percent for 16- to 24-year-olds to 78 percent for 45- to 54-year-olds. The relative earnings advantages of those in Level 5 compared with those in Level 3 rise from 22 percent among 16- to 24-year-olds to 96 percent among 55- to 64-year-olds. Similar patterns are found on the quantitative scale. Of all the age groups, 55- to 64-year-olds tend to have the largest earnings differentials by literacy level. These findings clearly reveal that the age-earnings profiles of United States workers are substantially steeper for those with the strongest literacy proficiencies. They will experience the largest earnings gains as they move through their work lives.

In contrast, academic achievement appears to have either small or no statistically significant effects on the earnings of young adults (those below age 25), particularly those with no postsecondary education — a finding also noted by other researchers.[12] There are several explanations that could account for these results. For example, employed youth may often be confined to a relatively narrow range of jobs in retail trade and service industries in which academic skills are not highly relevant to job performance. Alternatively, employers may fail to take school performance and academic achievement into account when making hiring decisions for young entry-level workers.

The earnings advantages associated with higher literacy proficiencies varied considerably across the educational subgroups. Among workers who had completed some secondary education but not obtained a high-school diploma or GED, annual earnings do not rise consistently or significantly with higher prose, document, or quantitative skills (Table 4.10). For example, the mean annual earnings of those with 9 to 12 years of schooling who performed in Level 3 on the quantitative scale were equivalent to those of their peers who performed in Level 1. The absence of any simple relationship between annual earnings and literacy levels in this educational subgroup is due to several

Table 4.9—Relative annual earnings of the employed in selected literacy levels on the prose and quantitative scales, by age group: 1992

Literacy scale/ age group	Level 3 earnings as a percent of Level 1 earnings	Level 5 earnings as a percent of Level 3 earnings
Prose		
16 to 24	110	122
25 to 34	148	157
35 to 44	159	178
45 to 54	178	182
55 to 64	171	196
Quantitative		
16 to 24	129	108
25 to 34	162	156
35 to 44	186	180
45 to 54	173	194
55 to 64	193	184

SOURCE: U.S. Department of Education, National Center for Education Statistics, National Adult Literacy Survey, 1992.

factors. First, many adults who did not complete high school performed in Level 1, and many are older workers who have substantial years of work experience or who are foreign born. Second, a relatively high share of those in Levels 3 and 4 are young persons still in high school. Their limited work experience sharply reduces their expected earnings.

When the analysis of annual earnings data for persons without a high-school diploma is confined to adults between the ages of 25 and 64, the relationship between literacy levels and annual earnings is more consistent and positive (Table 4.11). Findings of a more comprehensive multivariate statistical analysis of the relationships between annual earnings and literacy skills among high-school dropouts are presented in Chapter Seven.

Among workers with at least a high-school diploma, the mean weekly earnings of those who performed in Level 3 were one-third to 50 percent higher than those of their counterparts with proficiencies in Level 1, while workers in Level 5 outearned those in Level 3 by 13 to 55 percent. Adults with

Table 4.10—Relative annual earnings of the employed in selected literacy levels on the quantitative scale, by educational attainment: 1992

Literacy scale/ educational attainment	Level 3 earnings as a percent of Level 1 earnings	Level 5 earnings as a percent of Level 3 earnings
Quantitative		
0 to 8 years	111	——
9 to 12 years	100	——
GED	136	——
High-school diploma	135	155
Some postsecondary	132	126
Two-year degree	154	113
Four-year degree or higher	140	149

Note: —— indicates that the number of cases is too small to provide reliable estimates.

SOURCE: U.S. Department of Education, National Center for Education Statistics, National Adult Literacy Survey, 1992.

Table 4.11—Mean annual earnings of adults age 25 to 64 without a high-school diploma or GED, by literacy level: 1992

	Mean annual earnings of those in level..				
Literacy scale	1	2	3	4 or 5	All
Prose	$12,840	$14,680	$17,730	$18,820	$14,350
Document	12,800	15,250	17,580	17,000	14,350
Quantitative	12,170	15,270	17,980	21,750	14,350

SOURCE: U.S. Department of Education, National Center for Education Statistics, National Adult Literacy Survey, 1992.

a bachelor's degree or higher had above-average earnings gains from higher proficiencies. Clearly, college graduates are not being treated as a homogeneous group in the nation's labor markets. Those with higher literacy proficiencies are sorted into positions with considerably higher earnings.

Correlations Between Literacy Proficiencies and Annual Earnings by Age Group

The preceding analyses revealed considerable variation across the age groups in the weekly and annual earnings of employed adults in the five literacy levels. As noted above, the relative earnings advantages from higher prose, document, and quantitative skills were considerably lower for young workers (below age 25). These general findings are in close accord with those of earlier studies. While higher basic academic proficiencies do seem to improve young, non-college bound high-school graduates' chances of finding work in the early years after graduation, and do improve worker productivity, they often do not significantly affect the weekly wages of employed young graduates.[13] As young workers move into their early and mid-twenties, the wage and earnings impacts of higher academic and technical skills tend to increase, though the pattern of such impacts appears to differ between men and women.[14] After age 23, the estimated impact of higher skills on weekly earnings substantially increases and becomes similar for White, Black, and Hispanic men.[15]

Earlier analyses explored the relationships between workers' literacy proficiencies and earnings by comparing mean weekly and annual earnings across the proficiency levels on each scale. A correlation analysis was undertaken to supplement these findings, with four weekly and annual earnings variables (weekly earnings, natural log of weekly earnings, annual earnings, and natural log of annual earnings) correlated with the prose, document, and quantitative scores of the employed by age group (Table 4.12). The 16 to 24 age group was further disaggregated to allow a separate correlation analysis of the earnings and proficiencies of young employed persons who were not enrolled in school at the time of the survey.

The correlation analysis findings are quite consistent with the earlier results. In general, the size of the simple correlations between each of the earnings variables and prose, document, and quantitative scores increases with age through the 45 to 54 age group. The correlation coefficients tend to be somewhat higher for the quantitative and prose scales than for the document scale. For example, the simple correlation coefficient between the natural log of weekly earnings of full-time workers and the prose scores of the nonelderly (age 16 to 65) employed was about .36. The coefficients ranged from a low of .13 for all 16- to 24-year-olds to a high of .42 for 45- to 54-year-olds. For employed persons age 16 to 24 who were not enrolled in school at the time of the survey, the correlation coefficient was moderately positive (.17), but was only 40 percent of the size of the correlation coefficient for employed 45- to 54-year-olds. Similar results occur when prose scores are correlated with annual earnings. The correlation coefficient between these two variables for all

Table 4.12—Simple correlations between literacy proficiencies and selected weekly and annual earnings variables, by age group: 1992

Literacy scale/ age group	Weekly earnings of full-time employed	Natural log of weekly earnings	Annual earnings of all employed	Natural log of annual earnings
Prose				
16 to 65	.226	.363	.274	.241
16 to 24, all	.153	.132	.068	.048
16 to 24, not in school	.184	.173	.152	.077
25 to 34	.247	.378	.301	.282
35 to 44	.306	.394	.292	.281
45 to 54	.249	.425	.352	.361
55 to 64	.181	.345	.247	.205
Document				
16 to 65	.205	.337	.244	.219
16 to 24, all	.168	.149	.071	.042
16 to 24, not in school	.206	.197	.168	.067
25 to 34	.242	.363	.285	.280
35 to 44	.292	.386	.286	.285
45 to 54	.225	.404	.331	.361
55 to 64	.197	.375	.260	.247
Quantitative				
16 to 65	.252	.395	.303	.271
16 to 24, all	.188	.170	.090	.070
16 to 24, not in school	.227	.221	.142	.100
25 to 34	.266	.394	.316	.311
35 to 44	.325	.422	.319	.314
45 to 54	.274	.460	.389	.391
55 to 64	.220	.405	.271	.240

Note: All of the above correlation coefficients are statistically significant at the .01 or .05 level except the correlation between document proficiencies and the natural log of the annual earnings of all adults age 16 to 24.

SOURCE: U.S. Department of Education, National Center for Education Statistics, National Adult Literacy Survey, 1992.

nonelderly employed is .274, and the sizes of these coefficients range from .07 for 16- to 24-year-olds to .35 for 45- to 54-year-olds.

Together these findings reveal weaker and more tenuous statistical relationships between the weekly and annual earnings of the youngest employees and their prose, document, and quantitative scores. Among the younger age groups, literacy proficiencies strongly influence school enrollment and formal educational attainment but do not appear to play a substantive sorting role in the labor market, at least in terms of weekly and annual earnings. Their sorting function becomes considerably stronger as young adults reach their mid to late twenties. The strength of the associations between proficiencies and earnings increase from age 25 to 54. Having employers recognize and reward young adults' literacy skills at an earlier stage in their labor market careers would seem highly desirable. Making the link between literacy skills and wages stronger and more immediate for those in their late teens and early twenties, and especially for young adults not enrolling in four-year colleges and universities, might provide stronger incentives for high-school students to acquire a solid base of such skills before graduating from high school.

Literacy Proficiencies, Literacy Activities at Work, and Annual Earnings

National Adult Literacy Survey respondents were asked to indicate how often they use various types of reading, writing, and mathematics or arithmetic skills at work and in their daily lives: every day, a few times a week, once a week, less than once a week, or never. The questions about job-related reading focused on their use of six types of materials: letters or memos; reports, articles, or magazines; manuals or reference books; directions or instructions; diagrams or schematics; and bills, invoices, or tables. The questions about job-related writing covered three types of materials: letters or memos; forms, bills, invoices, or budgets; and reports or articles. The question about job-related use of mathematics concerned applications in general.

The responses of employed persons age 16 to 65 were analyzed to calculate an average intensity of use, ranging from every day or a few times a week to less than once a week.[16] For reading and writing, this average intensity measure reflects use across the different areas of application. Someone who reads only letters would receive a lower score than someone who reads materials in four or five of the application areas. The frequencies of reading, writing, and mathematics use were then cross-tabulated with respondents' prose and quantitative literacy levels to determine the extent to which those with higher proficiencies were more likely to apply their literacy skills on the job (Tables 4.13 and 4.14).

Approximately one-fifth of all employed 16- to 65-year-olds used their reading skills on a wide array of tasks daily or nearly every day at work, another 37 percent used them once or a few times a week, and a surprisingly high 43 percent used them less than once a week. The frequency of job-related reading varied uniformly with workers' level of prose literacy. The percentage of the employed who used their reading skills daily or nearly every day ranged from 8 percent among those in Level 1 to 26 percent among those in Level 5. At the other end of the spectrum, nearly 71 percent of the employed who performed in the lowest level of prose literacy used their reading skills less than once a week, on average, compared with 40 percent of those in Level 3 and only 20 percent of those in Level 5.

Twenty-seven percent of the employed reported using their writing skills on an array of tasks every day or almost every day on the job, another 30 percent do so once or several times a week, and 42 percent used writing less than once a week. Again, employed adults who scored in the higher prose levels were consistently more likely than those in the lower levels to use their writing skills at work on a regular basis. Only one of nine employees in the lowest prose level reported writing every day, on average, while one-third of those in the two highest levels did so.

Table 4.13—Percentage of the employed age 16 to 65 who reported using reading skills on the job with various levels of average frequency, by prose literacy level: 1992

Frequency of use of reading skills	Percent of the employed in each prose literacy level who reported each frequency of use 1	2	3	4	5	All
Every day or nearly every day	8	17	22	25	26	20
Once or a few times a week	21	34	38	44	55	37
Less than once a week or never	71	50	40	31	20	43
All	100	100	100	100	100	100

SOURCE: U.S. Department of Education, National Center for Education Statistics, National Adult Literacy Survey, 1992.

Table 4.14—Percentage of the employed age 16 to 65 who reported using writing skills on the job with various levels of average frequency, by prose literacy level: 1992

Frequency of use of writing skills	Percent of the employed in each prose literacy level who reported each frequency of use 1	2	3	4	5	All
Every day or nearly every day	12	24	31	33	33	27
Once or a few times a week	17	27	31	38	45	30
Less than once a week or never	71	49	38	30	22	42
All	100	100	100	100	100	100

SOURCE: U.S. Department of Education, National Center for Education Statistics, National Adult Literacy Survey, 1992.

Employed individuals were far more likely to use arithmetic or mathematics frequently at work than to read or write frequently (Table 4.15).[17] This pattern of findings is partly due to the differences in the question on mathematics use. Unlike the questions on reading and writing, the mathematics question focused on general applications. Nearly 73 percent of employees said they used their mathematics skills every day or nearly every day, while 16 percent used them once or several times a week and 12 percent used them less than once a week. The frequency with which employees used mathematics on the job also varied positively with their level of quantitative literacy. Only half those who performed in Level 1 on the quantitative scale reported daily or near-daily use of mathematics at work, compared with 77 percent of those in Level 3 and 83 percent of those in Level 5.

To explore the relationships among employees' proficiencies, their use of these proficiencies on the job, and their earnings, the authors computed mean annual earnings for the employed in 15 categories defined by proficiency level and intensity of skills use (Tables 4.16 to 4.18). Overall, the higher one's prose and quantitative proficiencies and the more frequently one used prose and mathematics skills on the job, the higher were one's average annual earnings. While higher proficiencies offer greater access to more remunerative occupations, the economic return to such proficiencies appears to be directly related to the frequency with which such skills are applied on the job. "Use it

Table 4.15—Percentage of the employed age 16 to 65 who reported using mathematics skills on the job with various levels of average frequency, by quantitative literacy level: 1992

Frequency of use of mathematics skills	Percent of the employed in each quantitative literacy level who reported each frequency of use 1	2	3	4	5	All
Every day or nearly every day	50	71	77	79	83	73
Once or a few times a week	20	16	15	15	14	16
Less than once a week or never	31	13	8	6	3	12
All	100	100	100	100	100	100

SOURCE: U.S. Department of Education, National Center for Education Statistics, National Adult Literacy Survey, 1992.

or lose part of the returns from it" appears to be an appropriate description. Similar findings have previously been found to apply to the economic returns to a college education and to vocational and technical training at the postsecondary level. For example, four-year college graduates who obtain jobs that require, on average, less than 16 years of schooling receive considerably lower rates of return on their personal investments in formal schooling.[18]

The nature of the relationships among employees' prose proficiencies, their frequency of reading, writing, and mathematics use, and their annual earnings can be illustrated quite clearly with a few examples. Employees with prose scores in the Level 1 range who used their reading skills less than once a week had mean annual earnings of only $11,500. In contrast, those who scored in Level 3 and who read once or several times a week had annual earnings of $23,240, on average, and those in Level 5 who read either daily or almost every day earned $45,840. The relative size of the annual earnings differences between the highest and lowest cells is four to one.

Similarly, the relationships among employees' use of writing skills, their prose proficiencies, and their earnings also were very strong. The higher the respondents' level of prose literacy and the more often they write at work, the higher their annual earnings. Within each prose level, annual earnings are far higher for those who write more frequently.

In the area of quantitative literacy, the relationship between skill use and earnings was quite similar to that seen in the areas of reading and writing skills. The mean earnings of all those who used mathematics every day ($23,480)

Table 4.16—Mean annual earnings of the employed age 16 to 65 by prose literacy level and average frequency with which reading skills were used on the job: 1992

Frequency of use of reading skills	Mean annual earnings of the employed in each prose literacy level by reported frequency of use					
	1	2	3	4	5	All
Every day or nearly every day	$19,370	$22,460	$28,760	$38,890	$45,840	$30,780
Once or a few times a week	16,680	19,160	23,240	30,900	40,300	25,060
Less than once a week or never	11,500	12,210	13,540	16,440	21,000	13,370
All	12,190	16,190	20,590	28,330	38,000	21,080

SOURCE: U.S. Department of Education, National Center for Education Statistics, National Adult Literacy Survey, 1992

Table 4.17—Mean annual earnings of the employed age 16 to 65 by prose literacy level and average frequency with which writing skills were used on the job: 1992

Frequency of use of writing skills	Mean annual earnings of the employed in each prose literacy level by reported frequency of use					
	1	2	3	4	5	All
Every day or nearly every day	$17,970	$22,320	$28,000	$37,890	$48,150	$30,060
Once or a few times a week	17,550	19,160	22,450	29,990	37,560	24,540
Less than once a week or never	11,600	12,240	13,870	17,290	24,860	13,740
All	13,190	16,190	20,590	28,330	38,000	21,080

SOURCE: U.S. Department of Education, National Center for Education Statistics, National Adult Literacy Survey, 1992.

were considerably below those of adults who used reading and writing skills this often. This result, however, is partly due to the fact that the percentage of workers who reported using mathematics skills daily was substantially higher than the percentage who reported reading or writing daily on a variety of tasks. Further, it is important to remember that a wide range of math skills can be applied on the job, and the survey data do not permit differentiation between

Table 4.18—Mean annual earnings of the employed age 16 to 65 by quantitative literacy level and average frequency with which mathematics skills were used on the job: 1992

Frequency of use of mathematics skills	Mean annual earnings of the employed in each quantitative literacy level by reported frequency of use					
	1	2	3	4	5	All
Every day or nearly every day	$14,280	$17,190	$22,140	$30,500	$42,210	$23,480
Once or a few times a week	12,030	14,360	18,390	24,220	33,920	18,390
Less than once a week or never	9,920	11,250	12,070	14,940	——	11,550
All	12,360	15,830	20,160	28,420	40,160	21,080

Note: —— indicates that the number of cases is too small to provide reliable estimates.

SOURCE: U.S. Department of Education, National Center for Education Statistics, National Adult Literacy Survey, 1992.

simple arithmetic skills and more complex measurement and mathematical reasoning skills. Nevertheless, those with higher quantitative proficiencies consistently obtained higher annual earnings, and those who often use mathematics have higher annual earnings, regardless of their proficiencies. Again, the relative size of the annual earnings difference between the highest and lowest cells is slightly more than four to one.

Together, these results indicate that workers with the highest prose and quantitative proficiencies who applied these skills on a daily basis received the highest earnings in United States labor markets in the early 1990s, and their earnings premiums from the possession and use of such skills were quite substantial.[19] The influence of strong prose and mathematics skills on earnings, however, varied by the degree to which such skills were used in the job setting. This implies that the demand for higher proficiencies will need to increase as the literacy proficiencies of future workers increase in order to maintain a high return on such skill acquisition.

Endnotes

1. Respondents could report their wages on an hourly, weekly, monthly, or annual basis. Responses were converted by the author into a weekly earnings equivalent.

2. The National Adult Literacy Survey was administered during the first eight months of 1992. The March 1992 Current Population Survey (CPS), conducted near the middle of this period, was used to estimate the mean weekly earnings of all full-time wage and salary workers. According to national CPS data, the mean earnings of the full-time employed were $534, an estimate within $2 of the mean earnings estimate from the National Adult Literacy Survey, which includes the weekly earnings of the self-employed as well as wage and salary workers.

3. All of these differences are statistically significant except for the mean earnings of workers in Levels 4 and 5 on the document literacy scale. The difference falls slightly short of statistical significance at the .05 level using the Bonferroni adjustment procedure.

4. In accord with standard neoclassical wage theory, workers with higher marginal revenue products should receive higher wages, ceteris paribus. The link between more literate workers' higher productivity and their wages, especially among young adults without any postsecondary schooling, can be somewhat tenuous, however. See: John Bishop, "The Productivity Consequences of What is Learned in High School," Center for Advanced Human Resource Studies, Cornell University, Ithaca, 1988.

5. Earnings figures are given for all groups with sufficiently large sample sizes. A minimum of 210,000 weighted cases was required. Given an assessed sample of 26, 091 and an estimated national population of 191.3 million persons age 16 and older, the average sampling weight was more than 7,000. While sampling ratios varied by race/ethnicity, a weighted N of 210,000 equals, on average, approximately 30 sample observations.

6. Widening earnings differentials over the work life by proficiency level may help to explain the more steeply sloped age-earnings profiles for better educated workers. For a review of historical changes in age-earnings profiles for U.S. workers and the increasing size of the earnings differentials between college and high-school graduates over the life cycle, see: (i) Steven J. Davis,

op. cit.; (ii) Frank Levy, *Dollars and Dreams: The Changing American Income Distribution*, Norton, New York, 1988. (iii) Robert E. Litan, Robert Z. Lawrence, and Charles L. Schultz, "Improving American Living Standards," *Critical Choices*, The Brookings Institution, Washington, D.C., 1989, pp. 29-48.

7. See: (i) Steven J. Davis, "Cross-Country Patterns of Change in Relative Wages," in *National Bureau of Economic Research: Macroeconomics Annual 1992*, The MIT Press, Cambridge, 1992; (ii) Andrew M. Sum and Joanna Heliotis, "Declining Wages of the Young," in *Workforce*, Spring 1993, pp. 22-31.

8. The results of a multivariate statistical analysis, reported in Chapter Seven, reveal that persons age 16 to 65 with higher proficiencies, ceteris paribus, were significantly more likely to be in the labor force, to be employed, to work full time, and to work full time, year round.

9. This result would not hold if the labor supply curves of the more literate were "backward bending"; i.e., if those with higher real weekly earnings chose to work fewer weeks during the year In such a case, the reduced weeks of work would partly offset the increased expected annual earnings from higher hourly or weekly wages. Empirical evidence on labor supply elasticity (the relative responsiveness of hours worked to changes in real wages) generally reveals a moderately upward sloped labor supply curve for all workers combined. The labor supply decisions of women are much more sensitive to changes in their expected wage than are those of men and, for a number of male subgroups, the wage elasticity of labor supply is moderately negative. See: Ronald Ehrenberg and David Smith, *Modern Labor Economics*, Third Edition, New York, 1991.

10. For example, on the quantitative scale, the mean annual earnings of workers in Level 3 were 72 percent higher than those of workers in Level 1, while workers in Level 5 outearned those in Level 3 by 90 percent. In comparison, the relative sizes of the weekly earnings advantages for the same two groups were 62 percent and 75 percent, respectively. Similar findings occur on the prose scale.

11. In a number of cases, the differences between the mean earnings of these two groups were not large enough to be classified as statistically significant.

12. See: (i) John Bishop, "Basic Skills and Worker Productivity," Paper Prepared for an NIE Symposium on Research Findings on Education and Employment and Their Implications for Policymakers and Practitioners, November 1985; (ii) Ronald F. Ferguson, *Racial Patterns in How School and Teacher Quality Affect Achievement and Earnings*, John F. Kennedy School of Government, Harvard University, November 1990.

13. For a review of earlier research on this issue, see: John Bishop, "Basic Skills and Worker Productivity," pp. 8-13.

14. For example, Bishop finds that technical proficiencies and numerical operation skills matter most for the hourly earnings of men while math reasoning and numerical skills are most important for women.

15. The size of the simple correlations rose from .10 at age 20 to .28 at age 22 to .45 by age 27. See: Ronald F. Ferguson, op. cit.

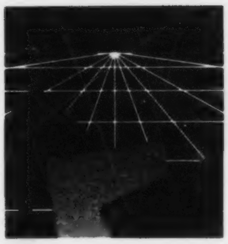
16. Responses to these questions on frequency of reading, writing, and mathematics skills on the job were assigned numerical codes ranging from 1 (every day) to 5 (never). Those with means of 1.00 to 1.99 were assigned to the "every day or nearly every day" group; those with means of 2.00 to 3.00 were assigned to the "once or several times per week" group; and those with means higher than 3.00 were assigned to the "less than once per week" group.

17. The higher reported frequency of mathematics skills use on the job may be attributable in part to the more general wording of the survey question. Unlike the questions on reading and writing, which focused on multiple tasks, the mathematics question referred to work in general rather than to any specific subset of assignments.

18. For examples of such studies, see: (i) Russell W. Rumberger, "The Impact of Surplus Schooling on Productivity and Earnings," in *The Journal of Human Resources*, Volume 22, Number 1, pp. 24-50; (ii) Richard R. Verdugo and Naomi Turner Verdugo," The Impact of Surplus Schooling on Earnings: Some Additional Findings," *The Journal of Human Resources*, Volume 24, Number 4, pp. 629-643.

19. These findings are reinforced by data from the January 1991 Current Population Survey (CPS), which asked respondents to indicate the frequency with which they used reading, writing, and mathematics skills in their current

jobs. Approximately one-quarter of the adults sampled were also asked to identify their weekly earnings. Workers who earned less than $200 per week were far less likely than those with higher earnings (in particular, those earning at least $1,000 per week) to use reading, writing, and mathematics skills often at work. Conversely, workers' mean weekly earnings rise substantially with the intensity of their skills use. Further, while the January 1991 CPS did not collect information on respondents' literacy skills, better educated workers were more likely to obtain jobs that require frequent use of literacy skills. Earnings rise consistently with years of schooling and with use of reading, writing, and mathematics skills at work. For a review of the questions in that survey, see: U.S. Census Bureau, *Current Population Survey, January 1991: Job Training Supplement Data Dictionary*, Washington, D.C., 1992. Weekly earnings and skills use data were available for about 12,000 workers.



CHAPTER FIVE

Literacy Proficiencies and Adults' Educational Attainments, School Enrollment Behavior, and Literacy Training Experiences

The human capital characteristics of adults can be expected to have important consequences for their success in U.S. labor markets in the 1990s. The preceding chapters have shown that adults' formal educational attainments are strongly associated with their potential to attain more highly skilled white-collar occupations and with their weekly and annual earnings. Together, literacy skills and levels of formal schooling play a major role in sorting members of the labor force among various occupational groups and in determining their earnings potential throughout their work lives. Young adults' and workers' educational attainments and their school enrollment and training experiences are not independent of their literacy proficiencies, however. On the whole, individuals with stronger literacy skills aspire to and expect to complete more schooling. They also do more homework, take more academic courses in high school, and are more likely to enroll in college preparatory programs, complete high school, enroll in college, complete college, enroll in seminars outside of work, and receive training from their employers.[1] A two-way relationship also exists between literacy skills and schooling, however, as those who complete more schooling do more homework, take more academic courses, and receive supplemental training are also more likely to demonstrate higher literacy proficiencies.

This chapter's primary aim is to examine relationships between the educational attainments, school enrollment behaviors, and literacy training experiences of the nation's adults and their literacy proficiencies as measured by this assessment. The analysis begins with a review of the prose, document, and quantitative proficiencies of all adults and of young adults (age 21 to 25) who had completed various levels of education. This is followed by findings of a series of multivariate statistical models designed to estimate the independent influence of literacy proficiencies on a number of educational attainment outcomes for the nation's 22- to 65-year-olds.

The school enrollment rates of labor force participants in each literacy level are then examined, as is respondents' previous involvement in literacy training activities in the workplace or the community. These results are supplemented by a brief review of findings from other recent national surveys on relationships between adults' educational attainments and literacy skills and their participation in an array of schooling and job training activities.

Literacy Proficiencies and Educational Attainment

In each dimension of literacy assessed, the mean proficiencies of the nation's adults — including not only those in civilian households but also those in prison — rose continuously, substantially, and significantly with the level of formal schooling they had completed by the time of the survey (Table 5.1). The only exception to this pattern is that there were no statistically significant differences in literacy scores, on average, between adults whose highest level of schooling was a GED certificate and those whose highest level was a high-school diploma.[2]

On the prose scale, mean scores ranged from a low of 177 for adults who had not continued their education beyond primary school to 231 for high-school dropouts, 270 for high-school graduates with no postsecondary education, 308 for associate's degree holders, 322 for bachelor's degree recipients with no postgraduate education, and a high of 336 for those with some formal schooling beyond the bachelor's degree. Each of these differences

Table 5.1—Mean literacy proficiencies, by highest level of education attained: 1992

Highest level of education attained	**Number (in millions)**	**Mean proficiency**		
		Prose	**Document**	**Quantitative**
Still in high school	8.268	271 (2.0)	274 (1.9)	269 (2.2)
0 to 8 years	18.356	177 (2.6)	170 (2.4)	169 (3.1)
9 to 12 years	24.982	231 (1.5)	227 (1.6)	227 (1.7)
GED	7.224	268 (1.8)	264 (2.2)	268 (2.7)
High-school diploma	51.250	270 (1.1)	264 (1.1)	270 (1.1)
Some postsecondary	39.634	294 (1.0)	290 (0.9)	295 (1.4)
Two-year degree	6.831	308 (2.4)	299 (2.6)	307 (2.8)
Four-year degree	17.804	322 (1.6)	314 (1.4)	322 (1.2)
Postgraduate studies/degree	16.306	336 (1.4)	326 (1.8)	334 (1.3)

Note: Age group = 16 or older. Numbers in parentheses are standard errors.

SOURCE: U.S. Department of Education, National Center for Education Statistics, National Adult Literacy Survey, 1992.

in mean prose proficiencies was statistically significant at the .01 level. These proficiency gaps are also quite large in absolute terms and in standard deviation units. The mean score of high-school graduates was nearly .8 standard deviations above that of high-school dropouts; the mean score of associate's degree holders was nearly .8 standard deviations above that of high-school graduates; and the mean score of bachelor's degree recipients was slightly more than one full standard deviation above that of high-school graduates. Similar patterns are found on the document and quantitative scales, where the gaps in performance among adults with varying levels of education are also quite large.

To determine whether these relationships between formal educational attainment and literacy also held true for the young adult population, who have moved through the educational system most recently, the authors examined the mean prose, document, and quantitative proficiencies of 21- to 25-year-olds with varying levels of education. Similar to the findings for the entire adult population, the mean literacy scores of young adults rise continuously and substantially with the level of education completed.[3] Thus, it seems to be as true for young adults as for adults in general that literacy proficiencies are considerably higher among those who completed the most years of formal schooling.

Findings of a Multivariate Statistical Analysis

Literacy proficiencies and formal educational attainment are likely to be mutually reinforcing. On the one hand, increased schooling is likely to improve one's literacy proficiencies relative to those with less schooling. It is also true that those with stronger literacy proficiencies are more likely to complete any given level of schooling and to enroll in advanced educational programs. Given the cross-sectional nature of the data from the National Adult Literacy Survey, however, it is not possible to determine the extent to which adults enrolled in formal educational programs significantly increased their literacy skills as a result of their participation in such programs.[4]

Knowledge of the influence of literacy proficiencies on the educational attainment of adults would be quite useful in appraising the overall importance of literacy skills. To estimate the independent contribution of adults' literacy proficiencies to their educational attainments, four different educational outcome variables — obtained a high-school diploma or GED, completed some postsecondary schooling, acquired a two-year degree or higher, earned a four-year degree or higher — were regressed against a set of demographic, socioeconomic, geographic, and literacy proficiency variables for adults between the ages of 22 and 65. The background variables included respondents' gender, age group, race/ethnicity, self-reported English-speaking ability, nativity status (native or foreign-born), disability status, mother's educational background, geographic region of residence, and estimated proficiencies.[5] Separate models were run with prose, document, and quantitative scores as predictor variables.

The following multivariate statistical analysis of the formal educational attainment of the nation's adults (age 22 to 65) is based primarily on the experiences of those who have completed their formal schooling. The prose, document, and quantitative proficiencies of these adults were measured at the time of the survey and therefore include the effects of their formal schooling experiences on their proficiencies. To the extent that past participation in formal schooling activities did independently raise the estimated proficiencies of these adults, estimates of the impacts of literacy proficiencies on their educational attainments will be somewhat upward-biased as a consequence of the potential interrelationships between these two variables. Given the cross-sectional nature of the National Adult Literacy Survey data, we cannot identify the specific influence of formal schooling activities on adults' literacy proficiencies.

There is, however, an alternative method for determining the potential for upward biases in the estimated effects of literacy proficiencies on adults' educational attainments, particularly beyond the high school diploma. During the past two decades, there have been several national longitudinal studies of the post-high school educational experiences of selected groups of high school students and adolescents. These longitudinal surveys included data on the academic achievement or basic academic skills test scores of these students while they were still in high school. By tracking over time the formal educational attainments of these students in selected academic achievement test score categories and comparing the mean in-school test scores of students in the various educational attainment categories, we can identify the size of the preexisting achievement test score gaps between students who went on to complete various years of postsecondary schooling and those who terminated their formal schooling upon high school graduation. If the test score gaps between young adults who went on to obtain a four-year college degree and those with only a high school diploma (in standard deviation units) are nearly identical in size to those from the National Adult Literacy Survey, then we can be reasonably confident that the potential for substantive upward bias in our estimates of the effects of literacy proficiencies on adults' educational attainments is quite limited.

Four national longitudinal studies provide data on the relationship between in-school academic proficiencies and eventual educational achievement: the National Longitudinal Survey of the Class of 1972, the National Longitudinal Survey of Youth Labor Market Experience, and the High School and Beyond surveys of the nation's 1980 sophomore and senior cohorts.[6] Tables 5.2 and 5.3 present key findings of these four surveys with respect to the relationships between academic achievement test scores of high school students and their educational attainment experiences through their young adult years.

Table 5.2—Percent of young adults obtaining a bachelor's or advanced academic degree by their initial position in the academic achievement or basic skills test distribution, selected national surveys

Class of 1972, as of 1986[i]

Quartile	Percent obtaining a degree
Bottom	8
Middle two	28
Top	60

National Longitudinal Survey of Youth, as of May 1991[ii]

	Percent obtaining a degree	
Quintile	Age 14 to 17	Age 18 to 22
Bottom	2	2
Middle	16	19
Top	61	61

High School and Beyond Survey[iii]

	Percent obtaining a degree	
Quartile	1980 seniors (as of 1986)	1980 sophomores (as of 1992)
Bottom	3	3
Second	12	18
Third	21	
Top	43	62

SOURCES: (i) National Center for Education Statistics, 1989; (ii) Center for Labor Market Studies, Northeastern University, tabulations of NLS public use data, 1979-91; test score distribution includes all persons in cohort regardless of their years of schooling completed; (iii) National Center for Education Statistics, 1995

Table 5.3—Estimates of the test score gaps between young high school graduates with no postsecondary schooling and postsecondary attendees or bachelor degree recipients, selected national surveys

	Class of 1972 (as of 1986)[i]	National Longitudinal Survey of Youth (as of 1991)[ii]		High School and Beyond 1980 Sophomores (as of 1992)[iii]
		Age 14 to 17	Age 18 to 22	
Mean (or median) test score of those with no postsecondary education	8	62	68	40th percentile[3]
Mean (or median) test score of those with some postsecondary education or bachelor's degree	14[1]	85	90	80th percentile[3]
Size of test score gap in standard deviation units	1.07	1.26[2]	1.21[2]	1.10

Notes: (1) Data are for those graduates who completed some postsecondary schooling in an academic institution of higher learning (Hollenbeck, 1992). (2) Gap is measured relative to the standard deviation of AFQT test scores for high school graduates with no post-secondary schooling. (3) Data are estimates of the median percentile rankings for the sophomore year test score distribution.

SOURCES: (i) National Center for Education Statistics, 1989; (ii) Center for Labor Market Studies, Northeastern University, tabulations of NLS public use data, 1979-91; test score distribution includes all persons in cohort regardless of their years of schooling completed. (iii) National Center for Education Statistics, 1995.

The seniors from the Class of 1972 were administered a battery of cognitive tests that were used to create a composite ability variable. Students can be assigned to various quartiles of the test score distribution for this variable. At the time of the fifth follow-up survey in 1986, approximately 31 percent of the members of the Class of 1972 had obtained a bachelor's or more advanced academic degree. The proportion doing so varied quite widely by their initial position in the ability test score distribution, ranging from a low of 8 percent for those in the bottom quartile to just under 60 percent for those in the top quartile (Table 5.2). The mean academic ability test score of the members of the Class of 1972 who went on to complete some postsecondary schooling was nearly 1.1 standard deviations above that of high school seniors who did not complete any postsecondary schooling (academic or occupational). The relative size of this test score difference was nearly identical to that found between National Adult Literacy Survey respondents who completed 16 or more years of schooling and those who only obtained a high school diploma (1.18 standard deviations on the prose scale and 1.12 standard deviations on the document scale).

The National Longitudinal Survey of Youth Labor Market Experience is based on an original national sample of approximately 12,700 youth who were age 14 to 22 at the time of the initial interview in 1979. During 1980, these youth were administered the Armed Services Vocational Aptitude Battery. Their scores on a subset of the tests (word knowledge, reading, arithmetic reasoning, numerical operations) were combined to form what is known as the Armed Forces Qualification Test, or AFQT.

We divided the original national cohort into two age groups: age 14 to 17, and age 18 to 22. Separate AFQT score distributions were then estimated for each of these age groups, and respondents were assigned to quintiles of the test score distribution for their respective age group. At the time of the 1991 interview, slightly more than 20 percent of the original cohort of 14- to 17-year-olds and 26 percent of those who completed high school had obtained a bachelor's degree. The share of these young adults who had earned a bachelor's or advanced degree ranged from a low of only 2 percent of those in the bottom quintile of the AFQT score distribution to a high of 61 percent of those in the top quintile (Table 5.2). The mean AFQT score of the bachelor's degree recipients was 1.26 standard deviations above that of their counterparts who terminated their formal schooling after graduating from high school (Table 5.3).

Quite similar findings apply to the 18- to 22-year-old cohort. Fewer than 2 percent of the members of this age group with AFQT scores in the bottom quintile had earned a bachelor's degree by 1991 versus 19 percent of those in the middle quintile and 61 percent of those in the top quintile. The difference between the mean AFQT scores of bachelor's degree recipients and high school graduates was equivalent to 1.21 standard deviations (as represented by the standard deviation for high school graduates). These test score gaps again are nearly identical in size to those for the same educational attainment groups in the National Adult Literacy Survey.

Finally, the High School and Beyond Longitudinal Survey has tracked two separate groups of 1980 high school students: sophomores and seniors. During 1980, these two groups were administered a battery of cognitive tests (vocabulary, reading, mathematics, writing) which were used to measure their academic ability. Their composite test scores were used to assign them into quartiles of the ability distribution for each of their respective classes. At the time of the 1986 follow-up survey, 19 percent of the 1980 seniors had obtained a bachelor's degree. The proportion doing so again varied markedly by quartile of the test score distribution, ranging from a low of 3 percent for those in the bottom quartile to a high of 43 percent for those in the top quartile (Table 5.2).

Among 1980 sophomores, 24 percent had obtained a bachelor's degree by the time of the 1992 follow-up survey. While only 3 percent of those in the bottom quartile had earned a bachelor's degree by 1992, just under 18 percent of those in the middle two quintiles and 62 percent of those in the top quartile had done so. The median ability test score of those 1980 sophomores who terminated their formal schooling with a high school diploma was equivalent to approximately the 40th percentile, versus the 80th percentile for those young adults who went on to receive a bachelor's or advanced degree (Table 5.3). The gap between the median test scores of these two groups was equivalent to approximately 1.1 standard deviations for the entire test score distribution for all 1980 sophomores. Again, the size of this gap was nearly identical to that for National Adult Literacy Survey respondents.

The above findings on the relationships between the in-school academic ability test scores of high school students and their post-high school educational attainments reveal test score patterns quite similar to those for National Adult Literacy Survey respondents whose proficiencies often were measured many years after they had completed their schooling. This strongly suggests that the following estimates of the independent influence of literacy proficiencies on the educational attainments of adult National Adult Literacy Survey respondents, especially postsecondary outcomes, should not be subject to any substantive degree of upward bias. The above findings also highlight a critical need for comprehensive studies of the influence of colleges and universities on the literacy proficiencies of students during the course of their enrollment.

The findings of the multivariate statistical analysis of adults' educational attainments are presented in Table 5.4, which shows the estimated effects of literacy proficiencies on the four educational outcome variables. The estimated coefficients of the proficiency variables (all of which were statistically significant at the .001 level) were used to estimate the expected independent impact of a 60-point increase in literacy scores on the likelihood of an individual obtaining each of the educational outcomes. A 60-point score difference equals nearly one standard deviation for each of the proficiency variables.[7]

Table 5.4—Estimated impact of a 60-point increase in literacy proficiencies on the likelihood of obtaining selected educational credentials, by literacy scale: 1992

Literacy scale/ educational attainment	Estimated impact	Significance level of proficiency variable	Mean value of schooling variable	Impact as percent of mean value
Prose				
High-school diploma/GED	.174	.001	.764	23
Some postsecondary	.234	.001	.431	54
Two-year degree or higher	.198	.001	.293	68
Four-year degree or higher	.168	.001	.220	76
Document				
High-school diploma/GED	.168	.001	.764	22
Some postsecondary	.216	.001	.431	50
Two-year degree or higher	.180	.001	.293	61
Four-year degree or higher	.156	.001	.220	71
Quantitative				
High-school diploma/GED	.168	.001	.764	22
Some postsecondary	.210	.001	.431	49
Two-year degree or higher	.168	.001	.293	58
Four-year degree or higher	.144	.001	.220	66

Notes: Age group = 22 to 65. Full findings of the multivariate statistical analysis are displayed in Appendix Tables 5A.1 to 5A.4.

SOURCE: U.S. Department of Education, National Center for Education Statistics, National Adult Literacy Survey, 1992.

The results show that among 22- to 65-year-olds estimated literacy proficiencies powerfully influenced the expected probability of securing each of the four educational outcomes.[5] In the models in which the prose score was entered as a predictor variable, a score increase of 60 points, ceteris paribus, would be expected to increase the likelihood of a respondent obtaining a high-school diploma or GED certificate by .174, or 17.4 percentage points. This estimated impact was equivalent to nearly 23 percent of the mean value of this schooling variable (.764). A 60-point increase in the prose score would raise the expected probability of a respondent completing one or more years of postsecondary schooling by 23.4 percentage points, an impact equivalent to 54 percent of the mean value of this schooling variable (.431). Finally, a 60-point prose score increase would raise the expected likelihood of obtaining a bachelor's degree by 16.8 percentage points, an impact equivalent to 76 percent of the mean value of this variable (.22).

The estimated effects of a 60-point increase in document and quantitative scores on educational outcomes are similar in magnitude to those for prose scores. The impact of increasing one's prose proficiencies on the likelihood of acquiring an associate's or bachelor's degree was, however, moderately greater than the impact of increasing one's document or quantitative proficiencies on these two educational outcomes. (These differences in estimated impacts were typically statistically significant.) Overall, the results of this analysis clearly indicate that adults' literacy proficiencies had powerful independent effects on their formal educational attainments.

Literacy Proficiencies and School Enrollment Among Young Adults

Another objective was to identify the degree to which the literacy skills of young adults who were enrolled in educational programs at the time of the survey exceeded those of their counterparts who were not in school. Accordingly, we estimated the mean scores of 21- to 25-year-olds in three educational attainment subgroups: those who had not completed high school and were not enrolled in school or college at the time of the survey; those whose highest level of education was a high-school diploma or GED and who were not enrolled in school or college; and those who were enrolled in school or college, regardless of their highest level of education (Table 5.5).[9] Approximately 15 million of the nation's young adults were in these three categories combined.

On each literacy scale, the mean scores of young adults who were enrolled in school or college substantially exceeded those of school dropouts and high-school diploma or GED recipients who were not enrolled in school. For example, the mean prose score of enrolled young adults (318) was 51 points, or more than 1.2 standard deviations, above the mean score for high-school graduates (267), and 91 points, or 2.3 standard deviations, above the mean score for school dropouts (227).[10] Large proficiency differences between the enrolled and non-enrolled young adult populations are also found on the

Table 5.5—Mean literacy proficiencies of adults age 21 to 25 in selected educational groups: 1992

Literacy scale/ educational group	Number (in millions)	Mean proficiency
Prose		
No high-school diploma or GED, not enrolled in school	3.115	227 (4.0)
High-school diploma or GED only, not enrolled in school	7.569	267 (2.4)
Any level of education, enrolled in school	4.352	318 (2.5)
Document		
No high-school diploma or GED, not enrolled in school	3.115	227 (4.6)
High-school diploma or GED only, not enrolled in school	7.569	269 (2.7)
Any level of education, enrolled in school	4.352	317 (2.1)
Quantitative		
No high-school diploma or GED, not enrolled in school	3.115	221 (4.1)
High-school diploma or GED only, not enrolled in school	7.569	268 (2.4)
Any level of education, enrolled in school	4.352	314 (2.9)

Note: Numbers in parentheses are standard errors.

SOURCE: U.S. Department of Education, National Center for Education Statistics, National Adult Literacy Survey, 1992.

document and quantitative scales. Clearly, young adults with stronger literacy proficiencies were substantially more likely than their less literate counterparts to be accumulating additional human capital in formal school settings.

School Enrollment Activities of Adults in the Labor Force

Over the past decade, a growing number of the nation's adults age 25 and older have enrolled in colleges and universities to continue their education. Using National Adult Literacy Survey data, it is possible to examine the characteristics of adult enrollees and assess the strength of the simple relationships between adult labor force participants' literacy proficiencies and their school enrollment rates.

In 1992, when the National Adult Literacy Survey was conducted, 8 percent of the nation's 25- to 64-year-old labor force participants were enrolled in school or college either part time or full time (Table 5.6).[11] The percentages of individuals enrolled in an educational program rose consistently with their estimated level of proficiency on each of the three literacy scales. On each scale, only about 5 percent of those who performed in Level 1 were attending some type of educational program at the time of the survey, compared with 8 percent of those in Level 3 and 13 to 16 percent of those in Level 5. All of the differences in school enrollment rates were statistically significant on each literacy scale except for those between Levels 1 and 2 and those between Levels 4 and 5. Labor force participants with the strongest prose skills (those in Level 5) were, thus, approximately three times as likely as those with the most limited skills to be accumulating human capital in a formal school setting.

It is also informative to compare school enrollment patterns for certain subgroups of the labor force (Table 5.6). Women were slightly but significantly more likely than men (9 percent, compared with 7 percent) to be attending school at the time of the survey. For both men and women, school attendance rates rose continuously with their level of prose, document, and quantitative proficiency. Among men, labor force members who performed in the highest level of prose and document literacy were four times more likely than those in Level 1 to be enrolled in a school program. Among women, the differences in school attendance rates between those in the highest and lowest levels of prose and document literacy were only slightly less than three to one.

Black adult labor force participants (9 percent) appeared to be slightly more likely than White or Hispanic adults (both 8 percent) to be attending school or college at the time of the survey, but these enrollment differences were not statistically significant. Within each of the three racial/ethnic groups, the share of labor force participants enrolled in school rose continuously and substantially with their level of proficiency on each of the three literacy scales. Among White labor force participants, the percentage of adults attending school rose from a low of 2 percent for those in the lowest level of document literacy to a high of nearly 15 percent for those in the highest level, a difference of nearly seven times. Among Black and Hispanic labor force members, those who performed in Level 4 on each scale were three to four times more likely to be enrolled in school than their counterparts who scored in Level 1. Across each of the gender and racial/ethnic groups, the more literate members of the labor force were accumulating additional human capital in the formal educational system at rates well above those of their less literate peers.

Literacy Training Among Adults in the Labor Force

In addition to gathering data on school enrollment experiences, the National Adult Literacy Survey asked respondents to indicate whether they had ever participated in a program outside of regular school to improve their basic skills — that is, their basic reading, writing, and arithmetic skills.

Table 5.6—Percentage of labor force participants enrolled in school or college at the time of the survey, total and by subpopulation: 1992

Subpopulation/ literacy level	Number (in millions)	Percent enrolled		
		Prose	Document	Quantitative
Total	102.0	8 (0.2)	8 (0.2)	8 (0.2)
1	14.1	5 (0.5)	5 (0.5)	5 (0.5)
2	24.5	5 (0.4)	5 (0.4)	6 (0.4)
3	35.6	8 (0.4)	8 (0.4)	8 (0.4)
4	22.9	12 (0.6)	12 (0.6)	11 (0.5)
5	4.9	15 (1.7)	16 (2.1)	13 (1.4)
Men	55.0	7 (0.3)	7 (0.3)	7 (0.3)
1	8.9	4	4	4
2	13.1	5	5	5
3	18.3	7	7	7
4	12.0	11	12	10
5	2.7	15	16	13
Women	47.0	9 (0.4)	9 (0.4)	9 (0.4)
1	5.2	5	6	6
2	11.3	6	6	7
3	17.3	9	9	9
4	10.9	13	13	12
5	2.2	14	15	14
White	78.5	8 (0.3)	8 (0.3)	8 (0.3)
1	5.4	2	2	3
2	17.0	4	4	5
3	30.2	8	8	7
4	21.2	11	12	10
5	4.7	14	15	13
Black	11.0	9 (0.7)	9 (0.7)	9 (0.7)
1	3.5	6	6	6
2	4.1	8	8	9
3	2.6	12	14	12
4	0.6	23	19	21
5	0.1	—	—	—
Hispanic	10.9	8 (0.8)	8 (0.8)	8 (0.8)
1	4.2	5	5	5
2	4.0	6	8	8
3	2.2	14	12	12
4	0.5	17	17	14
5	0.0	—	—	—

Notes: Age group = 25 to 64. Numbers in parentheses are standard errors. —— indicates that the number of cases is too small to provide reliable estimates.

SOURCE: U.S. Department of Education, National Center for Education Statistics, National Adult Literacy Survey, 1992.

Table 5.7—Percentage of labor force participants who had ever participated in basic skills training programs, by literacy level: 1992

	Percent in each level who had basic skills training					
Literacy scale	**1**	**2**	**3**	**4**	**5**	**All**
Prose	13 (1.2)	12 (0.7)	10 (0.5)	7 (0.7)	5 (0.7)	10 (0.4)
Document	14 (1.2)	11 (0.7)	10 (0.6)	7 (0.5)	7 (1.1)	10 (0.4)
Quantitative	13 (1.2)	13 (0.9)	9 (0.7)	8 (0.6)	7 (0.8)	10 (0.4)

Notes: Age group = 25 to 64. Numbers in parentheses are standard errors.

SOURCE: U.S. Department of Education, National Center for Education Statistics, National Adult Literacy Survey, 1992.

Approximately one of every 10 labor force participants age 25 to 64 indicated that they had participated at some time in such a training program (Table 5.7). Across the literacy scales, those with lower literacy proficiencies were more likely than their more literate peers to report having had some basic skills training. On the quantitative scale, for example, 13 percent of those in Level 1 and an equivalent percentage of those in Level 2 reported having been enrolled in a basic skills program, compared with 9 percent of those in Level 3 and 7 to 8 percent of those in the two highest levels. The differences in literacy program enrollment rates between those in Levels 1 and 2 and those in the three highest levels of quantitative proficiency were significant. The share of workers with very limited literacy proficiencies who had received any basic skills training was quite low, however. Only one of every eight labor force members who performed in the two lowest literacy levels had actually been involved in such training.

Respondents who reported that they were currently or previously enrolled in a basic skills training program were asked to indicate the nature of the program (employer- or union-sponsored program; publicly sponsored program; tutoring program sponsored by a library, church, or community-based organization; other type of program) and to indicate how recently they had taken part in this training.

Forty-three percent of the adult labor force participants who had received some basic skills training indicated that the program was given or sponsored by their company or labor union (Table 5.8).[12] The higher the enrollees' proficiency levels, the more likely that their training was employer- or union-sponsored. For example, only one-fourth of basic skills program participants who performed in the lowest level of prose literacy reported that their training

Table 5.8—Percentage of basic skills training participants in the labor force who had received this training from employers or labor unions, by literacy level: 1992

	Percent of basic skills training participants in each level who received this training from employers or unions					
Literacy scale	**1**	**2**	**3**	**4**	**5**	**All**
Prose	25	40	48	56	61	43
Document	32	35	51	56	61	43
Quantitative	29	37	49	57	75	43

Note: Age group = 25 to 64

SOURCE: U.S. Department of Education, National Center for Education Statistics, National Adult Literacy Survey, 1992.

was provided by an employer or a labor union, compared with 48 percent of those in Level 3 and 61 percent of those in Level 5. Similar patterns appear on the document and quantitative scales. These findings are quite consequential, since prior research has shown that workplace literacy programs generate favorable economic payoffs to participants, while the economic returns to other literacy programs are more mixed. A separate analysis of the National Adult Literacy Survey data revealed no significant effect of other literacy training on the weekly or annual earnings of the employed.

Taking into consideration both the incidence of basic skills training within each literacy level and the proportion of such training provided by employers or labor unions, one finds that workers in the lowest literacy level were no more likely than those in the higher levels to receive basic skills training in the workplace (Table 5.9). Only 3 percent of the labor force participants who scored in Level 1 on the prose scale received any basic skills training from their employers or unions, compared with 5 percent of those in Level 2 or 3 and 4 percent of those in Level 4. Workers in the highest prose level were as likely as their counterparts in the lowest level to receive basic skills training from their employers. The only significant difference among these five prose proficiency groups was that between workers in Levels 3 and 5. On both the document and quantitative scales, work force members in the two lowest levels were no more likely (4 percent) than those in Levels 3 through 5 to receive basic skills training from their employers or unions.

Table 5.9—Percentage of labor force participants who had ever received basic skills training from employers or labor unions, by literacy level: 1992

	Percent of labor force participants in each level who received basic skills training from employers or unions					
Literacy scale	**1**	**2**	**3**	**4**	**5**	**All**
Prose	3 (0.7)	5 (0.4)	5 (0.4)	4 (0.5)	3 (0.4)	4 (0.2)
Document	4 (0.7)	4 (0.5)	5 (0.4)	4 (0.4)	4 (0.9)	4 (0.2)
Quantitative	4 (0.6)	5 (0.5)	4 (0.5)	4 (0.4)	5 (0.7)	4 (0.2)

Notes: Age group = 25 to 64. Numbers in parentheses are standard errors.

SOURCE: U.S. Department of Education, National Center for Education Statistics, National Adult Literacy Survey, 1992.

The findings in Tables 5.8 and 5.9 indicate that only a small fraction (3 to 4 percent) of workers with the most limited literacy proficiencies have ever received basic skills training from their employers; that the frequency with which they received such training was, at best, only equal to that of their more literate counterparts; and that a majority of the least literate workers must instead rely on public educational agencies or community-based organizations for their basic skills education. Despite much rhetoric about the need for business support of basic education in the workplace, few workers appear to have participated in such training to date.

The survey data were used to examine not only the nature of respondents' basic skills training, but also the recency of this training. Just 5 percent of the 25- to 64-year-old members of the labor force reported that they had received some basic skills training in the past five years, representing about 45 percent of those who had ever received such training (Table 5.10). A basic education training rate of 5 percent over the past five years suggests that only about 1 percent of the members of the adult work force are receiving such training on an annual basis, either at work or elsewhere.

The proportion of adult work force members who had received any basic skills training in the past five years varied inversely by proficiency level. On the prose scale, 6 percent of those who performed in Level 1 or 2, 4 percent of those in Level 3, and approximately 3 percent of those in Level 4 or 5 reported having received basic skills training in the past five years. The rates of recent literacy training among workers in Levels 1 and 2 were significantly higher than

Table 5.10—Percentage of labor force participants who had received any basic skills training in the past five years, by literacy level: 1992

	Percent of labor force participants in each level who received any basic skills training in the past five years					
Literacy scale	**1**	**2**	**3**	**4**	**5**	**All**
Prose	6 (0.8)	6 (0.5)	4 (0.4)	4 (0.4)	3 (0.6)	5 (0.3)
Document	6 (0.8)	5 (0.5)	4 (0.4)	4 (0.4)	3 (0.7)	5 (0.3)
Quantitative	6 (0.7)	6 (0.6)	4 (0.4)	4 (0.4)	4 (0.6)	5 (0.3)

Notes: Age group = 25 to 64. Numbers in parentheses are standard errors.

SOURCE: U.S. Department of Education, National Center for Education Statistics, National Adult Literacy Survey, 1992.

those of workers in Levels 4 and 5. The results were quite similar for the document and quantitative literacy scales.

While work force members who performed in Levels 1 and 2 were significantly more likely than those in the two highest levels to have had some basic skills training in the past five years, such training was clearly not confined to them. Only about 18 to 21 percent of those who had received basic skills training in the past five years were in Level 1, despite the fact that these individuals had the most severe literacy deficits (Table 5.11). Slightly less than half of the recent basic skills training was obtained by work force members in the two lowest proficiency levels combined. In fact, workers who had participated in basic skills training in the past five years were as likely to have had scores in Levels 3 or 4 (46 to 50 percent) as they were to have had scores in the two lowest levels (48 to 52 percent).

These findings indicate that literacy training is not being provided to a high percentage of workers in the United States, although many adults display limited literacy proficiencies and appear to need such training to improve their work performance and upgrade their opportunities for promotion. More systematic information on the actual impacts of various types of literacy training programs on the proficiencies of adult workers is needed to improve our understanding of "what works for whom." While evidence of the need for such literacy training is considerable, the body of evidence on proven effectiveness is rather meager.

Table 5.11—Percentage distribution of labor force participants with basic skills training in the past five years, by literacy level: 1992

Literacy scale/level	Percent in level
Prose	
1	18
1 or 2	48
3 or 4	50
Document	
1	21
1 or 2	52
3 or 4	46
Quantitative	
1	20
1 or 2	49
3 or 4	46

Note: Age group = 25 to 64

SOURCE: U.S. Department of Education, National Center for Education Statistics, National Adult Literacy Survey, 1992.

Findings of Other National Surveys on Adults' School Enrollment and Training Experiences

Other recent national surveys provide information on the school enrollment behavior and training experiences of the adult work force. While nearly all of these surveys collect data on respondents' levels of education, few simultaneously gather information on their basic academic or literacy skills.[13] Findings of three surveys—the October 1991 Current Population Survey, the January 1991 Job Training Supplement to the Current Population Survey, and the National Longitudinal Surveys of Youth (1986 to 1991)—are displayed in Table 5.12.

Approximately 7 percent of all 25- to 64-year-old labor force participants in the nation were enrolled in school in October 1991.[14] The likelihood of attending school varied widely with the number of years of schooling they had completed. Less than 2 percent of those adults who failed to graduate from high school and only 3 percent of high-school graduates were enrolled in school, compared with 10 to 11 percent of those who had completed some postsecondary education. The school attendance rate of labor force participants

Table 5.12—Adults' school enrollment and training experiences, by number of years of schooling completed: selected years

School enrollment or training experiences	Percent in each category by years of schooling completed: 0 to 11	12	13 to 15	16 or more	All
Percent of labor force participants enrolled in school—1991[i]	2	3	11	10	7
Percent of employed adults who received any training—1991[ii]	18	34	47	61	42
Percent of employed adults who received reading, writing, or math skills training—1991[ii]	1	4	7	10	6
Percent of employed adults who received job-specific training —1991[ii]	11	22	30	39	27
Percent of young adults who received any training over the next five years—1986[iii]	19	34	45	50	38
Percent of young adults who received employer training over the next five years—1986[iii]	9	19	28	35	24
Percent of young adults who worked for firms where training was available—1991[iv]	28	45	58	68	—

Note: — indicates that no data are available.

SOURCES: (i) October 1991 Current Population Survey School Enrollment Supplement; tabulations by Center for Labor Market Studies, Northeastern University. Definition of school included vocational or technical schools as well as colleges and universities. Age = 25 to 64. (ii) January 1991 Current Population Survey Job Training Supplement; tabulations by Center for Labor Market Studies, Northeastern University. Age = 16 and older. (iii) Jonathan R. Veum, "Training Among Young Adults: Who, What Kind, and For How Long?" Monthly Labor Review, August 1993. "Over the next five years" = 1986 to 1991. Age = 21 to 29. (iv) 1991 National Longitudinal Surveys of Youth Labor Market Experience; tabulations by U.S. Bureau of Labor Statistics, Report 849, July 1993. Age = 26 to 33.

with 13 to 15 years of schooling was three times higher than that of high-school graduates and more than six times higher than that of school dropouts.

In January 1991, 42 percent of all employed adults (age 16 and older) reported that they had received some training to improve their skills, either on or off the job, since obtaining their current job.[15] High-school graduates (34 percent) were about twice as likely as school dropouts (18 percent) to have had some training, and employed four-year college graduates (61 percent) were nearly twice as likely as high-school graduates to have had training.

Six percent of employed adults in 1991 reported that they had received some training to improve their reading, writing, or math skills. This could have been basic literacy training, math training for statistical process control, or training in writing skills. High-school graduates (4 percent) were nearly three times more likely than dropouts (1 percent) to have participated in such training programs, and four-year college graduates (10 percent) were nearly three times more likely to do so than high-school graduates (4 percent).

More than one-quarter (27 percent) of the nation's workers in 1991 indicated that they had received job-specific training since beginning their current job. Again, employed high-school graduates (22 percent) were roughly twice as likely as school dropouts (11 percent) to have received job-specific training, and four-year college graduates (39 percent) were nearly twice as likely as high-school graduates to have received such training. Thus, work force members with a high-school or college education were substantially more likely than those with fewer years of education to have been the recipients of general as well as job-specific training.[16]

National Longitudinal Survey of Youth data reveal that 38 percent of the young adults who were age 21 to 29 in 1986 received some type of training either on or off the job between 1986 and 1991.[17] The percentages of young adults who had obtained some training also varied widely by years of schooling completed. Only about one of five young adults without a high-school diploma had received any training, compared with 34 percent of high-school graduates and 50 percent of four-year college graduates. The differences in their rates of receiving company-sponsored training were even greater. Only 9 percent of the school dropouts reported that they had received any training from their employers between 1986 and 1991, compared with about one-fifth of high-school graduates and 35 percent of college graduates. Individuals with four-year degrees were therefore 50 percent more likely than high-school graduates to have received some type of training, but were 82 percent more likely to have obtained company-sponsored training. Firms' investments in their young adult work force were clearly strongly associated with these individuals' levels of formal schooling.

Further research on the training experiences of young adults categorized by their basic academic skills (as measured by the Armed Forces Qualification Test, or AFQT, scores) revealed that those with higher proficiencies were consistently more likely than those with lower proficiencies to receive training, especially from employers. Young adults in the highest proficiency category were more than three times as likely as their counterparts in the lowest category to have received company-sponsored training. Among those who had been given training, the mean number of hours of apprenticeship and company training were generally higher for young adults with above-average proficiencies. Better educated and more literate young adults were more likely to obtain company-sponsored and apprenticeship training and to receive more intensive training from their employers. These types of training investments have repeatedly been found to have strong economic payoffs for participants.[18]

The greater frequency of company-sponsored training among better educated young adults is partly influenced by their higher frequency of employment, by their being employed more often in firms offering training opportunities, and by their being selected more often for participation in employer training programs. The 1991 National Longitudinal Survey collected information on the availability of training opportunities within the firms in which young adults were employed. The findings indicated that the better educated young adults were considerably more likely to be working in firms in which training was available. The percentages of young adults who reported that their employers offered such opportunities ranged from a low of 28 percent for school dropouts to a high of 68 percent for college graduates (Table 5.12). Employers of college graduates tend to have characteristics (employment size, industry) that are clearly more conducive to providing human capital investments.[19] Reducing the large differentials in human capital investment opportunities between the more and less educated and the more and less literate will require fundamental shifts in the training strategies of America's employers and expanded public support of training investments by many small firms employing non-college bound youth in the nation's growing trade and service sectors. Such investments will be critical to the success of future efforts to reduce the widening earnings gaps between the nation's best educated and less well educated workers.

Endnotes

1. See: (i) Gordon Berlin and Andrew M. Sum, *Toward A More Perfect Union . . .*; (ii) Charles F. Manski and.David A. Wise, *College Choice in America*, Harvard University Press, Cambridge, 1983; (iii) William R. Morgan, "Quantity of Learning and Quality of Life for Public and Private High School Youth," in *Youth and the Labor Market* (Editor: Michael E. Borus), W.E. Upjohn Institute for Employment Research, Kalamazoo, 1987, pp. 111-156; (iv) Robert E. Taggart, Andrew M. Sum, and Gordon Berlin, "Basic Skills: The Sine Qua Non," *Youth and Society*, September 1987, pp. 3-21; (v) Jonathan R. Veum, "Training Among Young Adults: Who, What Kind and For How Long?", *Monthly Labor Review*, August 1993, pp. 27-32.

2. Similar findings on the statistical equality of the mean scores of young adults with GED certificates and high school diplomas were found in analyses of 1980 AFQT test scores and of the 1985 NAEP Young Adult Literacy Survey results. See: (i) Andrew Sum, Robert Taggart, and Gordon Berlin, *Cutting Through*, Research Report Prepared for the Ford Foundation Project on Social Welfare and the American Future, New York, 1987; (ii) Richard L. Venezky, Carl F. Kaestle, and Andrew M. Sum, *The Subtle Danger*, pp. 34-36.

3. On the quantitative scale, for example, the mean score for all young adults was 279. Mean proficiencies ranged from a low of 175 for those who had completed zero to eight years of schooling to 233 for those who had completed nine to 12 years, 269 for those whose highest level of education was a high-school diploma or GED, and 322 for those who had earned a four-year degree. Similar to the findings for all adults, the mean literacy proficiencies of high-school graduates exceeded those of high-school dropouts by .7 standard deviations, and bachelor's degree recipients outperformed high-school graduates by 1.2 standard deviations.

4. In their longitudinal research on high school sophomores from 1980 to 1982, Don Rock and his research colleagues at Educational Testing Service discovered that individuals who were still in high school in 1982 had significantly higher gains in reading, vocabulary, math, and science than their counterparts who had dropped out of school. See: Donald A. Rock, et al., *Study of Excellence in High School Education. Longitudinal Study, 1980-82, Final Report*, Educational Testing Service, Princeton, New Jersey, 1982.

5. The reported educational attainment of the respondent's mother was used to create four categorical variables: mother did not complete high school,

mother graduated from high school but completed no postsecondary schooling, mother completed one to three years of postsecondary schooling, and mother was a four-year college graduate. The base group for the analysis was respondents whose mothers were high-school graduates.

6. Findings of the 1986 follow-up survey with respect to the educational attainment of members of the Class of 1972 appeared in the following two publications: (i) Carl Schmitt, *Changes in Educational Attainment: A Comparison Among 1972, 1980, and 1992 High School Seniors*, National Center for Education Statistics, Washington, D.C., April 1989; (ii) Kevin Hollenbeck, *Postsecondary Education as Triage: Returns to Academic and Technical Programs*, W.E. Upjohn Institute for Employment Research, Kalamazoo, June 1992. Findings from the longitudinal High School and Beyond Survey for seniors from the Class of 1980 and for the sophomore class of 1980 appear in the following two publications: (i) Carl Schmitt, op.cit.; (ii) John Tuma and C. Dennis Carroll, *High School and Beyond: Educational Attainment of 1980 High School Sophomores by 1992*, National Center for Education Statistics, Washington, D.C. 1995.

7. The estimated standard deviations in scores for 22- to 65-year-olds were 65, 65, and 66 points for the prose, document, and quantitative scales, respectively.

8. In each of the educational outcome models, the standardized regression coefficients for the proficiency variables were the largest, substantially exceeding those of all other variables including mother's educational attainment.

9. Respondents were asked whether they were currently enrolled in school or college, either full or part time. The school could have been a high school or equivalency program, vocational school, business school, college, or university. A second question asked respondents to indicate the type of degree, credential, or accreditation they expected to earn, if any.

10. The estimated standard deviations of the scores for enrolled 21- to 25-year-olds were 41, 42, and 43 points, respectively, on the prose, document, and quantitative scales.

11. This estimated rate of school attendance is somewhat higher than that derived from the October 1991 Current Population Survey. According to the

author's analyses of the results of that survey for the same age group, slightly less than 5 percent of 25- to 64-year-old labor force participants were enrolled in college and about 7 percent were attending college or a business, vocational, or technical training school.

12. According to standard human capital theory, employers would not be expected to provide general training, such as basic academic skills training, to workers unless they accepted lower wages in return for training. Otherwise, employers would not be able to recoup their investment costs. In the real world, however, a number of large and medium-sized firms provide such training as a way to improve worker productivity and as a less costly alternative to raising wages to attract a more literate work force during periods of labor shortages.

13. A major exception is the National Longitudinal Survey of Youth Labor Market Experience. In 1980, the National Longitudinal Survey tested a national sample of youth with the Armed Services Vocational Aptitude Battery (ASVAB). Scores from the Armed Forces Qualification Test (AFQT), part of the battery, are often used by labor market researchers to represent the basic academic skills of young adults. See: Office of the Assistant Secretary of Defense, *Profile of American Youth: 1980 Nationwide Administration of the Armed Services Vocational Aptitude Battery*, Washington, D.C., March 1992.

14. The school enrollment rate of 25- to 64-year-olds not active in the labor force at the time of the survey was equivalent to that of labor force participants. However, school enrollment rates ranged from 2.4 percent for those without a high-school diploma to 13 to 16 percent for adults with some postsecondary schooling.

15. Individuals who failed to respond to the training question were excluded from this analysis. Thus, the 42 percent estimate for those receiving some type of training is based only on individuals who answered the question.

16. Not surprisingly, college-educated workers were also considerably more likely than high-school graduates and dropouts to report having received management-related training on their current jobs.

17. The National Longitudinal Survey has been administered annually since 1979 to an original national sample of nearly 12,700 14- to 22-year-olds. After the 1986 survey, the questionnaire was redesigned to capture information on all

types of training received since the last interview. Data on weeks and hours of training were collected for each training activity. See: Jonathan R. Veum, op. cit., pp. 27-28.

18. See: (i) Patrice Flynn, "Training Workers for Evolving Jobs," *Workforce*, Summer 1993, pp. 33-37; (ii) John L. Iacobelli and S. Roy Schultz, "Earnings Impact of Employment and Training Programs for Young Men," *Growth and Change*, October 1979, pp. 32-37; (iii) Lisa M. Lynch, "Race and Gender Differences in Private-Sector Training for Young Workers," in *Proceedings of the Forty-First Annual Meeting, Industrial Relations Research Association*, Madison, 1987; (iv) Stephen Mangum and Arvil V. Adams, "The Labor Market Impacts of Post-School Occupational Training for Young Men," *Growth and Change*, Fall 1987, pp. 57-73.

19. For a review of the estimated influence of both job and human capital characteristics on the likelihood of training among young adults using a multivariate statistical framework. See: (i) Joseph G. Altonji and James R. Spletzer, "Worker Characteristics, Job Characteristics, and the Receipt of On-the-Job Training," *Industrial and Labor Relations Review*, Vol. 45, No. 1, 1991, pp. 58-79; (ii) Lisa M. Lynch, op. cit.

APPENDIX 5A

Definitions of the Variables in the Multivariate Statistical Analysis of Adults' Educational Attainments

Dependent Variables

HSGRAD

The high school diploma/GED status of the respondent = 1 if the respondent had obtained a high school diploma or a GED certificate, = 0 if else

POSTSEC

The postsecondary educational attainment status of the respondent = 1 if the respondent had completed one or more years of postsecondary schooling, = 0 if else

DEGTW

The postsecondary degree status of the respondent = 1 if the respondent had obtained an associate's or higher degree, = 0 if else

DEGFOUR

The postsecondary degree status of the respondent = 1 if the respondent had obtained a bachelor's or more advanced degree, = 0 if else

Independent Variables

FEMALE

The gender status of the respondent = 1 if female, = 0 if male

AGE2

The age group of the respondent = 1 if 25-34, = 0 if else

AGE3

The age group of the respondent = 1 if 35-44, = 0 if else

AGE4

The age group of the respondent = 1 if 45-54, = 0 if else

AGE5

The age group of the respondent = 1 if 55-65, = 0 if else

BLACK

The race-ethnic origin of the respondent = 1 if Black not Hispanic, = 0 if else

HISP

The race-ethnic origin of the respondent = 1 if Hispanic, = 0 if else

ASIAN/PI

The race-ethnic origin of the respondent = 1 if Asian/Pacific Islander, = 0 if else

OTHER

The race-ethnic origin of respondent = 1 if American Indian or other, = 0 if else

NONENG

The primary language of the respondent = 1 if Other than English, = 0 if English

FOR5

The nativity status of the respondent = 1 if foreign born and lived in the U.S. for five years or less, = 0 if else

FOR6

The nativity status of the respondent = 1 if foreign born and lived in the U.S. for six or more years, = 0 if else

DISAB

The disability status of the respondent = 1 if respondent reported a physical or mental disability, = 0 if else

REGION2

The geographic region of the residence of the respondent = 1 if residence is the South, = 0 if else

REGION3
The geographic region of the residence of the respondent = 1 if residence is the Midwest, = 0 if else

REGION4
The geographic region of the residence of the respondent = 1 if residence is the West, = 0 if else

MOMDROP
The educational attainment of the mother of the respondent = 1 if mother did not graduate from high school, = 0 if else

MOMSOME
The educational attainment of the mother of the respondent = 1 if mother completed one to three years of post-secondary schooling, = 0 if else

MOMCGRAD
The educational attainment of the mother of the respondent = 1 if mother obtained a bachelor's or more advanced degree, = 0 if else

PROSE
The prose proficiency of the respondent.

DOC
The document proficiency of the respondent.

QUANT
The quantitative proficiency of the respondent.

APPENDIX 5B

Findings of the Multivariate Statistical Analysis of the Effects of Literacy Proficiencies on Adults' Educational Attainments

Table 5A.1—Findings of the multivariate statistical analysis of the factors influencing the high school graduation status of adults, including prose, document, and quantitative proficiency

Independent Variables	Prose	Document	Quantitative
CONSTANT	-.044 (1.56)	-.008 (.29)	-.014 (.49)
AGE2	.017 (1.26)	.081 (.84)	.013 (.91)
AGE3	.032** (2.28)	.038*** (2.76)	.027* (1.92)
AGE4	.028** (1.86)	.042*** (2.90)	.022 (1.47)
AGE5	-.002 (.12)	.016 (.980)	-.016 (1.02)
FEMALE	-.014* (1.79)	-.000 (.05)	.019** (2.46)
BLACK	.030** (2.24)	.030** (2.38)	.054*** (4.08)
HISP	-.050*** (3.17)	-.062*** (3.86)	-.045*** (2.72)
ASIAN	.108*** (3.77)	.098*** (3.43)	.084*** (3.01)
OTHER	-.105*** (3.09)	-.114*** (3.29)	-.100*** (3.01)
DISAB	-.106*** (7.84)	-.116*** (8.46)	-.099*** (6.94)
REGION 2	-.010 (.89)	-.007 (.64)	-.008 (.76)
REGION 3	-.030*** (2.89)	-.027*** (2.64)	-.028*** (2.65)
REGION 4	-.010 (.88)	-.001 (1.6)	-.003 (.26)
NONENG	-.119*** (4.85)	-.137*** (5.76)	-.132*** (5.77)
FOR5	.189*** (6.51)	.180*** (6.23)	.168*** (5.82)
FOR6	.057*** (3.41)	.046*** (2.69)	.036** (2.17)
MOMDROP	-.057*** (6.45)	-.056*** (6.23)	-.062*** (7.02)
MOMSOME	.044*** (3.52)	.050*** (4.05)	.051*** (4.08)
MOMCGRAD	.042*** (3.08)	.045*** (3.12	.057*** (3.99)
PROFICIENCY	.0029*** (34.16)	.0028*** (33.49)	.0028*** (32.69)
N	9,597	9,597	9,597
R^2	.282	.274	.283
F	178.8	171.9	180.4
SIG of F	.001	.001	.001

Notes: Age group = 22 to 65. Numbers in parentheses are T-statistics. N = effective sample size

***.01 significance **.05 significance *.10 significance

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Table 5A.2—Findings of the multivariate statistical analysis of the factors influencing the postsecondary educational attainments of adults, including prose, document, and quantitative proficiency

Independent Variables	Prose	Document	Quantitative
CONSTANT	-.747*** (21.58)	-.668*** (21.53)	-.635*** (20.36)
AGE2	.028** (1.83)	.021* (1.41)	.025* (1.56)
AGE3	.074*** (4.73)	.084*** (5.35)	.073*** (4.23)
AGE4	.078*** (4.55)	.098*** (5.84)	.073*** (4.23)
AGE5	.053*** (2.98)	.074*** (4.10)	.033** (1.80)
FEMALE	-.042*** (4.78)	.024*** (2.81)	-.001 (.07)
BLACK	.081*** (5.16)	.076*** (5.13)	.098*** (6.48)
HISP	.063*** (3.48)	.045** (2.42)	.061*** (3.14)
ASIAN	.187*** (5.65)	.173*** (5.21)	.154*** (4.76)
OTHER	-.013 (.33)	-.028 (.71)	-.016 (.41)
DISAB	-.001 (.06)	-.017 (1.10)	-.001 (.08)
REGION 2	-.025* (1.93)	-.021 (1.62)	-.022* (1.70)
REGION 3	-.001 (.13)	.001 (.10)	.000 (.00)
REGION 4	.009 (.64)	.020 (1.50)	.020 (1.40)
NONENG	.080*** (2.78)	.046* (1.70)	.038 (1.43)
FOR5	.255*** (7.71)	.241*** (7.28)	.224*** (6.72)
FOR6	.119*** (6.18)	.101*** (5.18)	.086*** (4.49)
MOMDROP	-.075*** (7.38)	-.074*** (7.17)	-.083*** (8.09)
MOMSOME	.166*** (11.34)	.176*** (12.23)	.181*** (12.46)
MOMCGRAD	.235*** (15.33)	.243*** (15.06)	.264*** (15.63)
PROFICIENCY	.0039*** (36.52)	.0036*** (40.13)	.0035*** (38.32)
N	9,597	9,597	9,597
R^2	.316	.298	.298
F	211.2	193.8	194.3
SIG of F	.001	.001	.001

Notes: Age group = 22 to 65. Numbers in parentheses are T-statistics. N = effective sample size.
*** .01 significance ** .05 significance * .10 significance

Table 5A.3—Findings of the multivariate statistical analysis of the factors influencing the likelihood that an adult obtained an associate's or higher degree, including prose, document, and quantitative proficiency

Independent Variables	Prose	Document	Quantitative
CONSTANT	-.676*** (21.01)	-.608*** (20.01)	-.556*** (18.48)
AGE2	.003 (.23)	-.002 (.13)	.002 (.11)
AGE3	.046*** (3.14)	.054*** (3.69)	.046*** (3.04)
AGE4	.074*** (4.66)	.091*** (5.80)	.071*** (4.40)
AGE5	.053*** (3.20)	.072*** (4.20)	.037** (2.13)
FEMALE	-.059*** (7.25)	-.044*** (5.49)	-.025*** (3.07)
BLACK	.061*** (4.24)	.057*** (4.05)	.070*** (4.89)
HISP	.027 (1.60)	.012 (.68)	.022 (1.22)
ASIAN	.190*** (6.18)	.178*** (5.77)	.162*** (5.34)
OTHER	-.024 (.66)	-.037 (.99)	-.030 (.81)
DISAB	.000 (.02)	-.014 (.93)	-.004 (.23)
REGION 2	-.045*** (3.75)	-.042*** (3.47)	-.043*** (3.50)
REGION 3	-.007 (.67)	-.005 (.45)	-.006 (.55)
REGION 4	-.030** (2.36)	-.020 (1.56)	-.020 (1.53)
NONENG	.114*** (4.30)	.084*** (3.34)	.070*** (2.79)
FOR5	.272*** (8.80)	.261*** (8.41)	.245*** (7.83)
FOR6	.146*** (8.12)	.131*** (7.20)	.117*** (6.50)
MOMDROP	-.056*** (5.87)	-.055*** (5.74)	-.063*** (6.60)
MOMSOME	.156*** (11.57)	.166*** (12.29)	.172*** (12.71)
MOMCGRAD	.292*** (20.26)	.299*** (19.91)	.318*** (20.48)
PROFICIENCY	.0033*** (33.76)	.0030*** (33.62)	.0028*** (31.09)
N	9,597	9,597	9,597
R^2	.289	.273	.267
F	185.3	171.4	166.2
SIG of F	.001	.001	.001

Notes: Age group = 22 to 65. Numbers in parentheses are T-statistics. N = effective sample size.

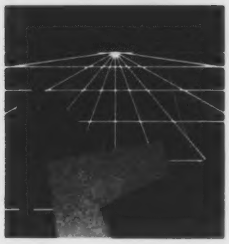
***.01 significance **.05 significance *.10 significance

Table 5A.4—Findings of the multivariate statistical analysis of the factors influencing the likelihood that an adult obtained a bachelor's or higher degree, including prose, document, and quantitative proficiency

Independent Variables	Prose	Document	Quantitative
CONSTANT	-.651°°° (20.38)	-.571°°° (21.36)	-.534°°° (20.75)
AGE2	.042°°° (3.18)	.038°°° (2.87)	.041°°° (2.97)
AGE3	.090°°° (6.66)	.098°°° (7.23)	.091°°° (6.48)
AGE4	.121°°° (8.23)	.136°°° (9.35)	.119°°° (7.96)
AGE5	.099°°° (6.44)	.114°°° (7.26)	.085°°° (5.33)
FEMALE	-.099°°° (6.55)	-.036°°° (4.87)	-.020°°° (2.65)
BLACK	.034°° (2.54)	.027°° (2.10)	.040°°° (3.04)
HISP	.000 (.02)	-.015 (.95)	-.006 (.37)
ASIAN	.168°°° (5.92)	.157°°° (5.51)	.144°°° (5.11)
OTHER	-.049 (1.46)	-.063° (1.83)	-.056° (1.65)
DISAB	-.005 (.36)	-.019 (1.43)	-.010 (.71)
REGION 2	-.054°°° (4.73)	-.050°°° (4.44)	-.051°°° (4.48)
REGION 3	-.020°° (1.99)	-.019° (1.78)	-.020° (1.84)
REGION 4	-.063°°° (5.47)	-.054°°° (4.65)	-.055°°° (4.57)
NONENG	.129°°° (5.20)	.097°°° (4.11)	.087°°° (3.72)
FOR5	.265°°° (9.24)	.253°°° (8.79)	.239°°°° (8.28)
FOR6	.139°°° (8.34)	.124°°° (7.38)	.112°°° (6.73)
MOMDROP	-.036°°° (4.05)	-.036°°° (4.03)	-.043°°° (4.828)
MOMSOME	.118°°° (9.45)	.128°°° (10.24)	.133°°° (10.66)
MOMCGRAD	.255°°° (18.99)	.264°°° (19.06)	.279°°° (19.57)
PROFICIENCY	.0028°°° (29.30)	.0026°°° (33.07)	.0024°°° (31.84)
N	9,597	9,597	9.597
R^2	.261	.241	.237
F	160.7	144.5	141.8
SIG of F	.001	.001	.001

Notes: Age group = 22 to 65. Numbers in parentheses are T-statistics. N = effective sample size.

°°° .01 significance °° .05 significance ° .10 significance



CHAPTER SIX

The Employability and Earnings Potential of the Nation's Unutilized and Underutilized Working-age Population

In addition to examining the prose, document, and quantitative proficiencies of the full-time employed, it is important to identify the skills of those members of the nation's working-age population who are potentially eligible to work but are either unemployed or not actively looking for work and those who are working only part time and may desire more hours of work. How many potential workers or additional full-time workers are there with minimally adequate or better literacy and numeracy proficiencies? This information would be useful in identifying the reservoir of labor potentially available for meeting the future labor requirements of the nation's private and public employers.

This chapter focuses primarily on three groups of so-called "unutilized" and "underutilized" members of the working-age civilian non-institutional population: the part-time employed, the unemployed, and the inactive labor force reserve.[1] Proficiency standards based on workers' actual prose and quantitative scores were selected, and the numbers of unutilized and underutilized individuals with proficiencies that could meet or exceed these standards were determined. Findings are presented for each of the three groups of unutilized and underutilized adults and for those in several demographic subgroups. The final section of this chapter examines the degree to which key segments of the nation's poor or near poor and disabled populations could meet these various employability and earnings performance standards.

The Estimated Size of the Unutilized and Underutilized Working-age Population

At any point in time, some fraction of the nation's active labor force participants are "unutilized" or "underutilized." The most frequently measured group of unutilized individuals is the unemployed, or those who are not working but are available for work and actively seeking work.[2] In addition to the unemployed, the civilian labor force contains individuals who are only working part time (less than 35 hours per week), many of whom would like to work full time if additional hours of employment were offered at prevailing wages.[3] Many part-time workers are therefore also underutilized. Finally, the potential labor force includes an inactive reserve — persons who have not worked in the past year, but who have recent work experience, do not regard themselves as retired, and may choose to work, given the right opportunity.[4]

At the time of the National Adult Literacy Survey, 45.5 million individuals were classified as members of one of these unutilized or potentially underutilized labor market subgroups (Table 6.1). The 23.6 million part-time employed accounted for slightly more than half of the total pool of unutilized and underutilized adults, and the 13.6 million unemployed represented another 30 percent. The remaining 8.3 million persons were members of the inactive labor force reserve. The absolute size of the unutilized and underutilized labor pool was quite substantial, and the figures would be even larger if they included those who were "mal-employed" — that is, who were working full time but were employed in occupations that did not fully utilize their skills and abilities. There are personal and social costs incurred by these mal-employed persons, including lower earnings and reduced real output.

Table 6.1—Number of adults in each unutilized or underutilized labor force subgroup: 1992

Labor market subgroup	Number (in millions)
All	45.500
Employed part time	23.600
Unemployed	13.557
Inactive labor force reserve	8.340

SOURCE: U.S. Department of Education, National Center for Education Statistics, National Adult Literacy Survey, 1992.

Establishing Employability- and Earnings-based Proficiency Standards

An assessment of the employability and earnings potential of the nation's unutilized and underutilized adults requires the establishment of a quantifiable set of proficiency benchmarks or standards. The National Education Goals Panel recently established a set of eight goals to guide education policy, including a goal related to adult literacy and lifelong learning.[5] Goal Six in the 1994 report *Building a Nation of Learners* states that "by the year 2000, every adult American will be literate and will possess the knowledge and skills necessary to compete in a global economy and exercise the rights and responsibilities of citizenship."

Converting the goal on the ability of workers "to compete in a global economy" into a practical set of literacy proficiency indicators and performance measures initially requires the selection of one or more proxy variables to represent the ability to compete. There are a number of alternative employment and earnings measures that could be chosen to represent the attainment of such a goal for an individual worker. On the one hand, one could claim that the ability of an individual to obtain employment or a full-time job represents the attainment of this goal. Proficiency benchmarks for this measure of employability would therefore be related to the literacy proficiencies actually possessed by employed U.S. adults. On the other hand, employment itself may be viewed as too general a measure of labor market success. The ability to secure a job providing some minimum level of earnings might be seen as a better indicator of an individual worker's ability to compete in the global economy. Several different earnings adequacy standards could then be used to establish proficiency benchmarks for future workers. These benchmarks would be expected to vary with the level of the earnings adequacy threshold: the higher the earnings standard, the higher will be the literacy proficiency standard for workers to achieve this desired outcome.

A key question therefore is, how many members of these unutilized or underutilized labor groups possess literacy proficiencies that can meet selected minimum employability or earnings standards? Answering this question requires the use of a set of minimum proficiency standards. Clearly, these prose, document, and quantitative standards would be expected to vary considerably by occupation, given variability in job contents, duties, and responsibilities. As reported earlier, the mean proficiencies of the employed varied considerably across and within major occupational groups. Rather than establish occupation-specific standards, then, a task well beyond the scope of this study, the authors defined general employability and earnings standards based on the actual proficiencies demonstrated by workers in the following employment and earnings subgroups:

- Persons employed part time or full time at the time of the survey

- Persons earning $250 or more per week at the time of the survey (equivalent to the poverty line for a four-person family in the U.S. in 1991)

- Persons earning $500 or more per week at the time of the survey (roughly equivalent to the mean weekly wage of persons employed full time)

Next the authors examined the actual prose and quantitative proficiencies of the members of each of these three groups. Although selecting a cutoff score on each literacy scale to represent a minimum standard is inherently a subjective decision, a proficiency score possessed by at least 80 percent of the members of a given employability or earnings group seemed to be a reasonable criterion. The implications of varying this standard upward or downward by 10 percentage points will be described below. Further, an 80 percent criterion was used by Educational Testing Service to estimate the literacy proficiencies of individual survey respondents (as discussed in the Introduction).

On the prose scale, the cutoff score for the "limited employability" category using the 80 percent criterion was 245 (Table 6.2). Individuals classified as having "limited earnings potential" are those with prose scores above the limited employability threshold but below 255. Individuals categorized as having "moderate earnings potential" (whose weekly earnings ranged from $250 to $500) have prose scores between 255 and 272, while those with prose scores at or above 272 are classified as having "average to above average earnings potential."

The cutoff scores for the quantitative scale are quite similar to those for the prose scale. Persons with quantitative proficiencies below 245 are designated as having "limited employability." Those with quantitative scores between 245 and 256 are defined as having "limited earnings potential," and those with scores between 256 and 274 are classified as having "moderate earnings potential." Individuals with "average to above average earnings potential" had quantitative scores of 274 or higher.

The selection of only one set of literacy benchmarks to assess the employability and earnings potential of the nation's unutilized and underutilized adults might seem too limiting. How would our estimates of the employability and earnings potential of these three labor market groups change

Table 6.2—Proficiency scores for the limited employability, limited earnings, and moderate earnings standards at selected proficiency thresholds on the prose and quantitative scales: 1992

	Prose			Quantitative		
Standard	**9th**	**19th**	**29th**	**9th**	**19th**	**29th**
Limited employability	<211	<245	<265	<208	<245	<265
Limited earnings potential	211-227	245-255	265-274	208-226	245-256	265-276
Moderate earnings potential	227-247	255-272	274-290	226-251	256-274	276-292
Average to above average earnings potential	>247	>272	>290	>251	>274	>292

SOURCE: U.S. Department of Education, National Center for Education Statistics, National Adult Literacy Survey, 1992.

if we used somewhat more or less rigorous proficiency standards? To provide insights on this issue, the authors utilized two alternative sets of proficiency standards: one set based on standards that would be met by 90 percent of the adults in a given employment or earnings category; and another, more stringent set that would be met by the highest performing 70 percent of the adults in each employment or earnings category.

Table 6.2 contains data that illustrate how the proficiency cutoff points would change as the standards were lowered or raised. On the prose scale, for example, the cutoff point for limited employability would be only 211 if the 90 percent threshold were used, but would rise to 265 if the 70 percent threshold were used. Similarly wide variations in prose score standards occur for the moderate or higher earnings potential measure. Using the scores of the 9th percentile of the distribution as the cutoff point yields a prose score threshold of only 227 or higher, while the adoption of a much more rigorous standard (the performance level of the 29th percentile) would raise the threshold for moderate or higher earnings to 274 or above. Very similar findings apply to the quantitative scale.

The impacts of these alternative proficiency standards on our estimates of the share of the unemployed that could meet selected employability and earnings criteria are displayed in Table 6.3 for both the prose and quantitative literacy scales. Using the 19th percentile of the distribution as the cut point for limited employability yields an estimate of 35 percent of the unemployed as not

Table 6.3—Percentage distribution of the unemployed across the limited employability, limited earnings, and moderate earnings thresholds for alternative proficiency standards: 1992 (Numbers in percents)

	Prose			Quantitative		
Standard	**9th**	**19th**	**29th**	**9th**	**19th**	**29th**
Limited employability	15	35	50	18	38	52
Limited earnings potential	9	8	9	9	9	8
Moderate earnings potential	12	14	11	16	13	12
Average to above average earnings potential	64	43	31	57	41	29

Note: Numbers presented are column percentages.

SOURCE: U.S. Department of Education, National Center for Education Statistics, National Adult Literacy Survey, 1992.

sufficiently proficient in prose skills. The proportion failing to meet this criterion would decline to only 15 percent if the performance of the 9th percentile were used as the cut score, but would rise sharply to 50 percent if the performance of the 29th percentile were used as the benchmark. Only 43 percent of the unemployed were categorized as possessing average to above average earnings potential when the 19th percentile was used as the minimum performance benchmark. However, 64 percent would be classified as possessing minimally adequate proficiencies if the 9th percentile were used, and only 31 percent would be categorized as possessing average to above average earnings potential if the 29th percentile were used as the benchmark. For the remainder of this chapter, we will use the 19th percentile as the proficiency benchmark for determining the proportion of the unutilized and underutilized adult population with minimally adequate prose and quantitative proficiencies.

The estimated prose and quantitative proficiencies of each member of the unutilized and underutilized populations were compared to these employability and earnings threshold scores to determine their appropriate classification. Findings for each of the three labor market subgroups based on the 80 percent standard are summarized in Table 6.4.

The part-time employed were the least likely to be characterized by either limited employability or limited earnings proficiencies. Only 26 percent of the part-time workers were assigned to either of these two groups based on their prose scores, in contrast to 43 percent of the unemployed and 40 percent of the inactive labor force reserve. Nearly two-thirds (63 percent) of the part-time employed had prose scores sufficiently high to place them in the average to above average earnings potential category. Somewhat less than half the unemployed and the inactive labor force reserve had average or above earnings potential based on their estimated prose proficiencies.

Clearly, the unutilized and underutilized populations were quite heterogeneous with respect to their employability and earnings potentials. Nearly one-third of the individuals in these three groups combined had prose proficiencies that would be expected to severely restrict their current employment and earnings potential; however, many (43 to 63 percent) performed well enough to be categorized as having average to above average earnings potential.

Stated differently, it appears that there was a substantial reservoir of unutilized and underutilized adults in the nation's labor markets who had moderate or better literacy proficiencies at the time of the survey. According to these analyses, there were somewhat more than 24 million such adults with average or better earnings potential. This is an extraordinarily large group of individuals whose labor can be more effectively utilized by employers in this

Table 6.4—Distribution of the unemployed, part-time employed, and inactive labor force reserve across the employability and earnings categories: 1992 (Numbers in percents)

	Percent in each category			
Literacy scale/ labor market subgroup	Limited employability	Limited earnings potential	Moderate earnings potential	Average to above average earnings potential
Prose				
Employed part time	21	5	11	63
Unemployed	35	8	14	43
Labor force reserve	33	7	14	46
Quantitative				
Employed part time	23	7	11	59
Unemployed	39	7	13	41
Labor force reserve	35	7	13	44

SOURCE: U.S. Department of Education, National Center for Education Statistics, National Adult Literacy Survey, 1992.

country. Thus, concerns about severe future labor shortages resulting from literacy mismatches seem to be somewhat misplaced.

The employability and earnings potential of the unutilized and underutilized were fairly similar on the quantitative scale. Here, however, slightly higher proportions of each group were characterized by either limited employability or earnings potential. For example, 30 percent of the part-time employed were assigned to either the limited employability or the limited earnings potential category, as were 42 percent of the members of the inactive labor force reserves and 46 percent of the unemployed. Each of these shares was higher than that on the prose scale. Still, a clear majority (59 percent) of the part-time employed and 23.2 million (or 51 percent) of the unutilized and underutilized populations had quantitative proficiencies that were sufficiently high to classify them as having average to above average earnings potential. The unutilized and underutilized labor force thus contains many individuals with quantitative proficiencies sufficiently high to obtain jobs paying weekly wages at or above $500 per week.

To identify the degree of variability in the earnings potential of key subgroups of the part-time employed, the unemployed, and the inactive labor force reserve, the authors estimated the percentage of individuals in gender, racial/ethnic, age and educational attainment subgroups with prose and quantitative scores at or above the moderate earnings threshold ($250 or more per week).

On the prose scale, the percentage of individuals with moderate or higher earnings potential varies by labor force group (Table 6.5). About three-quarters of the part-time employed, 62 percent of the unemployed, and 60 percent of the labor force reserve were categorized as having moderate or higher earnings potential, based on their prose scores.

Among the part-time employed, women (79 percent) were more likely than men (65 percent) to possess prose proficiencies that would place them in the moderate or higher earnings potential category. Eighty-one percent of the White and 68 percent of the Asian/Pacific Islander part-time employed had moderate or higher earnings potential on the prose scale, compared with less than half the Black (42 percent) and 37 to 57 percent of the Hispanic part-time employed. High fractions of part-time workers younger than age 55 were assigned to the moderate or higher earnings potential category, while lower percentages (54 to 65 percent) prevailed for the oldest subgroups. The general patterns of findings by demographic subgroup were quite similar for the unemployed and the inactive labor force reserve. It should be noted, however, that smaller fractions of both groups (62 percent and 60 percent, respectively)

Table 6.5—Percentage of each labor force group with moderate or higher earnings potential on the prose and quantitative literacy scales, by demographic subgroup: 1992

Literacy scale/ demographic subgroup	Percent with moderate or higher earnings potential: Part-time employed	Unemployed	Inactive labor force reserve
Prose			
All	74	58	60
Sex			
Male	65	56	60
Female	79	60	60
Race/ethnicity			
White	81	69	73
Black	42	39	37
Hispanic			
Cuban	43	50	——
Mexican	37	38	40
Other	57	50	32
Asian/Pacific Islander	68	42	——
Age group			
16 to 24	79	63	63
25 to 34	74	58	62
35 to 44	80	59	59
45 to 54	74	50	55
55 to 64	65	49	36
65 and older	54	23	——
Quantitative			
All	70	54	58
Sex			
Male	66	55	58
Female	74	53	58
Race/ethnicity			
White	78	68	72
Black	35	27	30
Hispanic			
Cuban	43	37	——
Mexican	36	35	37
Other	49	36	29
Asian/Pacific Islander	77	47	——
Age group			
16 to 24	74	57	62
25 to 34	69	56	58
35 to 44	76	56	58
45 to 54	69	50	53
55 to 64	65	54	39
65 and older	59	24	——

Note: —— indicates that the number of cases is too small to provide reliable estimates.

SOURCE: U.S. Department of Education, National Center for Education Statistics, National Adult Literacy Survey, 1992.

possessed prose proficiencies high enough to place them into the moderate or higher earnings potential category.

When the quantitative proficiencies of the unutilized and underutilized are used to rate their earnings potential, somewhat lower percentages of each group are found to possess the requisite proficiencies. Only 70 percent of the part-time employed, 54 percent of the unemployed, and 57 percent of the inactive labor force reserve were classified as having moderate or higher earnings potential.

The patterns of findings for the demographic subgroups on the quantitative scale are similar to those for the prose scale. Female part-time workers were somewhat more likely than males to be assigned to the moderate or higher earnings potential group on the quantitative scale; however, the gap was smaller than that for the prose scale (8 percentage points versus 14 points), and there were no significant differences between men and women among the unemployed and inactive labor force reserve.

The earnings potential of the members of the inactive labor force reserve was examined by educational attainment subgroup (Table 6.6). Not surprisingly, the findings reveal that the likelihood of having moderate or higher earnings potential rose strongly and consistently with the level of formal education. On the prose scale, only 20 percent of inactive labor force reserve members with eight or fewer years of schooling and only 43 percent of those without a high-school diploma or GED had moderate or higher earnings potential versus two-thirds of those with a high-school diploma, 85 percent of those with a two-year degree, and 88 percent of those with a four-year degree or higher. The pattern of findings for the quantitative scale was nearly identical, with the proportion of the inactive labor force reserve with moderate or higher earnings potential ranging from a low of 14 percent for those with only a primary school education to a high of just under 90 percent for those with a four-year degree. Similar to the earlier findings for the nation's civilian labor force, the best educated members of the inactive labor force reserve possess prose and quantitative proficiencies that are superior to those of their less educated counterparts.

Table 6.6—Percentage of the inactive labor force reserve with moderate or higher earnings potential on the prose and quantitative literacy scales, by educational attainment: 1992

	Percent of inactive labor force reserve with moderate or higher earnings potential	
Educational attainment	**Prose**	**Quantitative**
0 to 8 years	20	14
9 to 12 years	43	43
GED	51	51
High-school diploma	66	60
Some postsecondary, no degree	73	70
Two-year degree	85	83
Four-year degree or higher	88	89

SOURCE: U.S. Department of Education, National Center for Education Statistics, National Adult Literacy Survey, 1992.

The Employability and Earnings Potential of the Poor or Near Poor and the Disabled

In recent years, there has been increasing concern over the problems of poverty in the nation as the numbers of poor persons and families increased during the recession of 1990-91 and the slow pace of employment growth during the first two years of the economic recovery.[6] At the same time, intensified public policy debates over strategies to reduce the number of dependent poor and the need to overhaul the welfare system have led to a renewed focus on the employability problems of welfare recipients.[7]

Chapter Two examined the literacy skills of poor/near poor adults who were employed or unemployed at the time of the survey. Table 6.7 presents data on the median prose and quantitative proficiencies of the unutilized and underutilized poor/near poor population.

On the prose scale, the median score for all poor and near poor adults was 246, equivalent to a percentile ranking of 30th for all working-age adults in the United States. Poor/near poor individuals who were either employed part time or unemployed at the time of the assessment had the highest median prose score (262), followed by the poor/near poor members of the inactive labor force reserve (250) and the poor/near poor who were not attached to the labor force (223).[8] The last group's median prose percentile ranking was only 20th. In

Table 6.7—Median prose and quantitative proficiencies and percentile rankings of the median proficiency scores of the poor/near poor, by labor force status: 1992

	Prose		**Quantitative**	
Subgroup of the poor/near	**Median proficiency**	**Median percentile rank**	**Median proficiency**	**Median percentile rank**
All	246	30	242	29
Employed part time or unemployed	262	39	258	36
Out of labor force	224	20	213	18
Inactive labor force reserve	250	32	245	30

SOURCE: U.S. Department of Education, National Center for Education Statistics, National Adult Literacy Survey, 1992.

other words, half these individuals performed in the bottom fifth of the prose score distribution for all working-age persons in the United States. Clearly, then, many poor/near poor individuals with no recent work experience face severe employability and earnings barriers. Further, the extremely weak literacy skills of those poor/near poor individuals who are not active in the labor force and who have young children at home greatly reduce their ability to educate their own children effectively. Previous national research studies have found that mothers' basic academic skills are a powerful predictor of their children's mental development.[9]

Although the poor/near poor tended to perform somewhat less well on the quantitative scale than on the prose scale, the relative rankings of the labor market subgroups were similar on the two scales. The median percentile ranking of the poor/near poor part-time employed and unemployed was 36th on the quantitative scale, compared with the 30th percentile for the inactive labor force reserve and only the 18th percentile for those with no recent attachment to the labor force.

To identify the percentage of the poor/near poor with the potential to achieve moderate or higher weekly earnings, the estimated prose and quantitative proficiencies of poor and near poor adults were compared to the cutoff scores used earlier to determine earnings potential (Table 6.8). A full year's employment, even with weekly earnings at the low end of the moderate wage standard, would permit a family of four to obtain annual earnings above the poverty threshold. Despite the fact that the average poor/near poor person had quite limited prose and quantitative scores, 45 percent of these individuals had a prose score sufficiently high to place them in at least the moderate earnings category. Fifty-five percent of the poor/near poor who were part-time employed or unemployed had prose scores that placed them in this category, as did 46 percent of those in the inactive labor force reserve. Of the poor/near poor with no work experience in the past three years, fewer than one in five had prose or quantitative scores that would give them moderate or higher earnings potential. Economically disadvantaged individuals with the weakest literacy skills were the least likely to be active in the labor force at the time of the survey or to have worked at any time in the past three years. Similar findings hold true for adult public assistance recipients.[10] The relatively high rates of unemployment and underemployment among those poor/near poor adults with moderate or better earnings potential who were active in the labor market suggest that demand-related factors played a key role in confining them to the ranks of the poor. Solving future poverty problems will therefore require both demand-side strategies to boost earnings opportunities and supply-side

Table 6.8—Percentage of the poor/near poor and disabled with moderate or higher earnings potential on the prose and quantitative scales, by labor force status: 1992

	Percent with moderate or higher earnings potential	
Group/labor force status	**Prose**	**Quantitative**
Poor/near poor		
All	45	42
Employed part time or unemployed	55	52
Out of labor force, no recent work experience	19	17
Inactive labor force reserve	46	43
Disabled		
All	37	37
Employed part time or unemployed	48	45
Inactive labor force reserve	45	45
Out of labor force, no recent work experience	26	19

SOURCE: U.S. Department of Education, National Center for Education Statistics, National Adult Literacy Survey, 1992.

strategies to improve the literacy skills and other employability traits of the adult disadvantaged.

The bottom half of Table 6.8 presents information on the weekly earnings potential of respondents with self-reported disabilities, a group whose employment problems were recently addressed by the U.S. Congress in its passage of the Americans with Disabilities Act. This group includes those individuals who reported in the National Adult Literacy Survey that they had "a physical, mental, or other health condition" that kept them from "participating fully in work, school, housework, or other activities."[11]

The estimated prose and quantitative proficiencies of each disabled respondent were compared to the proficiency standards used to identify moderate or higher earnings potential. Of the estimated 22.2 million individuals with some type of physical or other limiting condition, approximately three of eight had a prose or quantitative score that placed them in the moderate or higher earnings potential category.

Disabled individuals who were part of the unutilized or underutilized population had higher prose and quantitative proficiencies than those outside the labor force and were, thus, more likely to be assigned to the moderate or higher earnings potential category. Nearly half the disabled adults who were either working part-time or were unemployed at the time of the survey had a prose score high enough to place them in this earnings category, as did 45 percent of those in the inactive labor force reserve. In contrast, fewer than one-fourth of the disabled individuals with no recent work experience had prose or quantitative proficiencies high enough to place them in the moderate or higher earnings category. Improving the immediate and longer-term employability and earnings prospects of disabled individuals with no recent labor market attachment will likely require substantive educational investments to strengthen their prose, document, and quantitative skills.

Endnotes

1. The "inactive labor force reserve" consists of respondents who reported no paid employment in the 12 months before the survey but who had worked at some point in the past three years and who did not describe themselves as retired.

2. To be classified as unemployed in the monthly Current Population Survey, a respondent must have been available for work in the reference week of the survey. As noted in the Introduction, the National Adult Literacy Survey definition of unemployment is somewhat broader, since the background questionnaire did not include a question on availability for work during the reference week. Some of the unemployed may not have been available to take a job in the prior calendar week.

3. On average, in 1992, nearly 40 percent of the men and 25 percent of the women working part time in the United States claimed to be doing so for economic reasons rather than voluntarily. The difference in mean hours of work between those working full time and those working part time for economic reasons is nearly 20 hours per week. Previous research on the desired hours of work among the part-time employed, including those working part time voluntarily, has indicated that 40 percent of those persons working less than 30 hours per week wish to work more hours at the going market wage. Thus, many part-time workers are underutilized. See: Susan E. Shank, "Preferred Hours of Work and Corresponding Earnings," *Monthly Labor Review*, November 1986, pp. 40-44.

4. The National Adult Literacy Survey questionnaire did not include questions on the current job desires of those not participating in the labor force. The Current Population Survey does collect such information, however. In 1991 and 1992, 10 percent of the nonparticipants, or 5.7 to 6.2 million persons, expressed an interest in current employment. See: U.S. Bureau of Labor Statistics, *Employment and Earnings*, January 1993, Table 35, p. 214.

5. For a more detailed review of the national education goals, the rationale for their selection, and proposed indicators and timetables for their attainment by the nation, see: (i) National Education Goals Panel, *The National Education Goals Report: Building a Nation of Learners*, U.S. Government Printing Office, Washington, D.C., 1994; (ii) Goal 5 Work Group, Office of Educational Research and Improvement, U.S. Department of Education, *Reaching the*

Goals: Goal 5, Adult Literacy and Lifelong Learning, U.S. Government Printing Office, Washington, D.C., 1993.

6. The number of poor persons in the U.S. dropped by 11 percent from 1983 to 1989, then increased across the next three years. From 1989 to 1992, the estimated number of poor persons (all ages) rose from 31.5 to 36.9 million, an increase of 5.4 million or 17 percent. See: U.S. Bureau of the Census, *Current Population Reports, Series P-60, 185, Poverty in the United States: 1992*, U.S. Government Printing Office, Washington, D.C., 1993.

7. Other studies, such as the National Longitudinal Survey of Youth's (NLSY) administration of the 1980 Armed Services Vocational Aptitude Battery and the 1985 Young Adult Literacy Survey, have found very limited literacy skills among the non-employed and dependent poor in the U.S. See: Gordon Berlin and Andrew Sum, *Toward a More Perfect Union: Basic Skills, Poor Families, and Our Economic Future*, Ford Foundation Project on Social Welfare and the American Future, New York, 1988.

8. The inactive labor force reserve is a subset of individuals who were not active in the labor force at the time of the survey, but who had worked at some point in the three years prior to the survey. Thus, poor persons who had not been employed at any time in the prior three years had the lowest prose and quantitative scores, with a median percentile ranking close to the 12th percentile.

9. See: (i) Sonalde Desai, P. Lindsay Chase-Lansdale, and Robert T. Michael, "Mother or Market? Effects of Maternal Employment on the Intellectual Ability of 4-Year Old Children," *Demography*, Vol. 26, No. 4, November 1989, pp. 545-561; (ii) Toby L. Parcel and Elizabeth G. Menaghan, "Maternal Working Conditions and Children's Verbal Facility: Studying the Intergenerational Transmissions of Inequality from Mothers to Young Children," *Social Psychology Quarterly*, 1990, Vol. 53, No . 2, pp. 132-147.

10. For a more comprehensive assessment of the literacy proficiencies of adult welfare recipients based on the National Adult Literacy Survey findings, see: Paul E. Barton and Lynn Jenkins, *Literacy and Dependency: The Literacy Skills of Welfare Recipients in the United States*, Educational Testing Service, Princeton, N.J., 1995.

11. Adults participating in the National Adult Literacy Survey were asked to identify each type of physical or mental condition they had (e.g., learning disability, hearing problem, vision problem). Detailed analyses of the proficiencies of the disabled revealed that those who reported having a learning disability had mean scores well below those citing hearing or physical disabilities. See: Irwin S. Kirsch, Ann Jungeblut, Lynn Jenkins, and Andrew Kolstad, *Adult Literacy in America* . . . , pp. 135-137.

APPENDIX 6A

Estimating the Effects of Setting the Literacy Proficiency Standards for Limited Employability Based on the Prose and Quantitative Proficiencies of the Full-time Employed

The proficiency standards for employability discussed in the text of this chapter were based on the estimated prose and quantitative proficiencies of all of the employed, regardless of their part-time or full-time status at the time of the National Adult Literacy Survey. One might argue that proficiency standards for employability should have been based on the proficiencies of the full-time employed only. As noted in Chapters Two and Three, the mean proficiency scores of the full-time and part-time employed were typically quite close to each other (within 3 to 5 points on each scale), and among employed women the differences between these two groups were generally not large enough to be classified as statistically significant.

To determine the degree to which a shift in the employability standards based solely on the proficiencies of the full-time employed would alter any of our previous findings, we reestimated the limited employability cutoff scores on the prose and quantitative scales and then generated new estimates of the shares of the part-time employed, unemployed, and labor force reserves who could meet the new employability standards. All of our estimates used the 19th percentile as the cutoff point for selecting the minimum proficiency standard. Thus, 80 percent of the full-time employed had a prose or quantitative score in excess of the new standard.

Establishing the limited employability cutoff scores on the basis of the proficiencies of the full-time employed rather than all of the employed would only moderately raise the cutoff scores on the prose and quantitative scales. For example, the cutoff score (19th percentile) on the prose scale would be raised from 245 to 246, an increase of only 1 point, while the cutoff score on the quantitative scale would be increased from 245 to 247, a difference of only 2 points (Table 6A.1).

Given these new cutoff scores for the limited employability standard, we estimated the percent of the part-time employed, the unemployed, and the labor force reserve who had prose or quantitative proficiencies above the new employability standard for full-time workers. At the time of the National Adult

Literacy Survey, nearly 79 percent of the part-time employed, 67 percent of the members of the labor force reserve, and 64 percent of the unemployed had prose scores in excess of the minimum proficiency standard for employability (Table 6A.2). These estimated percentages were all within 1 percentage point of those based on the proficiency cutoff points for all of the employed. These findings are not surprising given the small difference between the prose cutoff scores for the full-time employed and all of the employed.

Table 6A.1—Comparisons of the limited employability cutoff scores on the prose and quantitative scales for all employed and full-time employed adults (19th percentile)

Employed group	Prose	Quantitative
All employed	245	245
Full-time employed	246	247
Difference	+1	+2

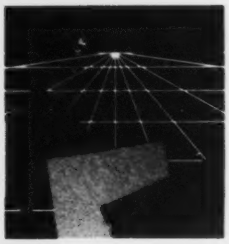
SOURCE: U.S. Department of Education, National Center for Education Statistics, National Adult Literacy Survey, 1992.

Table 6A.2—Estimates of the percent of the part-time employed, unemployed, and labor force reserve with prose and quantitative proficiencies above the limited employability standard for full-time workers

Labor market group	Prose	Quantitative
Part-time employed	79	77
Unemployed	64	60
Labor force reserve	67	63

SOURCE: U.S. Department of Education, National Center for Education Statistics, National Adult Literacy Survey, 1992.

Similar findings apply to the new employability standards for the quantitative scale, although slightly smaller percentages of each of the aforementioned groups meet the quantitative proficiency standard. Still, just under 77 percent of the part-time employed had quantitative scores above the new employability standard, as did 63 percent of the members of the labor force reserve and 60 percent of the unemployed. Each of these figures is within 2 percentage points of the prior estimates based on the quantitative proficiencies for all of the employed. Selecting the full-time employed as the appropriate reference group for determining employability standards, thus, would yield only slightly different standards than those based on the proficiencies of all of the nation's employed.



CHAPTER SEVEN

The Estimated Effects of Literacy Proficiencies on Labor Market Activities, Earnings, and Incomes: Findings of a Multivariate Statistical Analysis

Preceding chapters have reviewed the literacy proficiencies of the members of the United States labor force and examined statistical relationships between their literacy skills and employment status, occupational attachment, weekly and annual earnings, and poverty status. Most of these analyses involved either simple statistical relationships between adults' proficiencies and the mean values of these labor market, earnings, and income variables or simple correlations between workers' proficiencies and their weekly or annual earnings.

This chapter uses multivariate statistical models (linear probability models, multiple regression analysis) to identify the estimated effects of adults' literacy proficiencies on a diverse set of labor market, earnings, and income variables. The analyses are focused on civilians outside of the federal/state prison system who were between the ages of 16 and 65 at the time of the assessment.[1] These analyses are designed to isolate the independent contribution of higher prose, document, or quantitative proficiencies to improved employment outcomes and earnings.

The chapter begins by examining the estimated effects of literacy proficiencies on adults' labor force behavior, employment status, and unemployment problems. The analysis of these labor market outcomes is followed by a more detailed assessment of the estimated effects of higher literacy proficiencies on employed adults' weekly and annual earnings. This section also presents estimated earnings effects for an array of demographic, educational, and occupational subgroups and reviews variations in the estimated size of these earnings effects with intensity of use of literacy skills on the job. The last section of this chapter considers the estimated effects of higher literacy proficiencies on several income and disability variables, including respondents' poverty/near poverty status and cash public assistance income status at the time of the assessment.

Literacy Proficiencies and Labor Market Experiences

The estimated independent effects of a 60-point increase in prose, document, and quantitative proficiencies on adults' labor force status, employment status, and recent employment experiences are displayed in Tables 7.1 through 7.3.[2] The complete set of findings for these multivariate models is presented in Appendix 7B. In the models in which prose scores appear as a predictor variable, they have a significant positive influence on each labor market variable (Table 7.1). A 60-point increase in prose proficiency, ceteris paribus, was associated with an increased probability of 3 percentage points of a respondent actively participating in the civilian labor force, which was equal to nearly 4 percent of the mean likelihood of participation (79 percent). Such an increase in prose proficiency was associated with a decrease of 2 percentage points in the probability of being unemployed at the time of the assessment, which equals nearly 22 percent of its mean value (7 percent) for the 16- to 65-year-old sample. Given its positive association with active labor force participation and its negative association with being unemployed, higher prose proficiency was significantly associated with an increased probability of a respondent being employed at the time of the assessment. A 60-point rise in prose proficiency, ceteris paribus, was associated with an increase of 4 percentage points in the estimated likelihood of working, which equals a 6

Table 7.1—Estimated effects of a 60-point increase in prose proficiency on the expected probability of labor market outcomes: 1992

Labor market outcome	Absolute difference	Significance level of coefficient	Mean value of variable	Difference as percent of mean value
In the labor force*	.030	.01	.786	4
Unemployed*	-.018	.01	.081	-22
Employed*	.042	.01	.705	6
Employed full time*	.024	.01	.541	4
Employed full time, year-round last year	.030	.01	.433	7
Weekly earnings above poverty line**	.042	.01	.411	10

Notes: Age group = 16 to 65.

* At the time of the survey. ** For a four-person family, includes zero earners.

SOURCE: U.S. Department of Education, National Center for Education Statistics, National Adult Literacy Survey, 1992.

percent effect relative to the mean employment rate of 70 percent. More than half of the employment effect of higher prose scores was attributable to an increased likelihood of full-time employment. A 60-point increase in prose proficiency was associated with an increase of 2 percentage points in the rate of full-time employment, which represents 4 percent of the mean full-time employment rate (54 percent) for 16- to 65-year-olds.

Higher prose proficiencies also were positively associated with improvements in respondents' ability to secure year-round, full-time employment and to obtain weekly earnings above the poverty line.[3] A 60-point rise in prose scores was associated with a gain of 3 percentage points in the probability of year-round, full-time employment, which equals nearly 7 percent of the mean value of this variable (43 percent). Higher prose proficiencies also significantly increased the prospects for earning $250 or more per week at the time of the assessment. A 60-point gain in prose proficiency was associated with an increase of 4 percentage points in the likelihood of being employed and earning at least $250 per week, which represents 10 percent of the mean value. Overall, the findings in Table 7.1 reveal that stronger prose proficiencies have modest, statistically significant direct effects on each of the labor force, employment, and earnings variables examined. In relative terms, these effects were largest for the unemployment and earnings variables.

Higher document and quantitative proficiencies were also significantly associated with the likelihood that respondents would actively participate in the civilian labor force, avoid unemployment, secure employment (especially full-time and year-round employment), and obtain weekly earnings above $250 (Tables 7.2 and 7.3). The estimated sizes of the effects of document and quantitative proficiencies on respondents' labor force, unemployment, and employment status at the time of the assessment were nearly identical to those for prose proficiencies; however, the estimated effects of document and quantitative proficiencies on the full-time employment; year-round, full-time employment; and weekly wage variables were somewhat larger than the effects of prose proficiencies. For example, a 60-point gain in quantitative proficiency was associated with an increase of 4 percentage points in the likelihood of full-time employment, representing nearly 7 percent of the mean value of this variable. Such a gain was also associated with an increase of 4 percentage points in the probability of full-time, year-round employment, which equals nearly 10 percent of this variable's mean value. These two estimated effects were approximately 50 percent higher than those for the prose proficiency variable. In all cases, the estimated values of the coefficients for the prose, document, and quantitative proficiencies were statistically significant at the .01 level.

Table 7.2—Estimated effects of a 60-point increase in document proficiency on the expected probability of labor market outcomes: 1992

Labor market outcome	Absolute difference	Significance level of coefficient	Mean value of variable	Difference as percent of mean value
In the labor force*	.030	.01	.786	4
Unemployed*	-.018	.01	.081	-22
Employed*	.042	.01	.705	6
Employed full time*	.036	.01	.541	7
Employed full time, year-round last year	.036	.01	.433	8
Weekly earnings above poverty line**	.048	.01	.411	12

Notes: Age group = 16 to 65.

* At the time of the survey. ** For a four-person family; includes zero earners.

SOURCE: U.S. Department of Education, National Center for Education Statistics, National Adult Literacy Survey, 1992.

Table 7.3—Estimated effects of a 60-point increase in quantitative proficiency on the expected probability of labor market outcomes: 1992

Labor market outcome	Absolute difference	Significance level of coefficient	Mean value of variable	Difference as percent of mean value
In the labor force*	.030	.01	.786	4
Unemployed*	-.024	.01	.081	-30
Employed*	.042	.01	.705	6
Employed full time*	.036	.01	.541	7
Employed full time, year-round last year	.042	.01	.433	10
Weekly earnings above poverty line**	.048	.01	.411	12

Notes: Age group = 16 to 65.

* At the time of the survey. ** For a four-person family; includes zero earners.

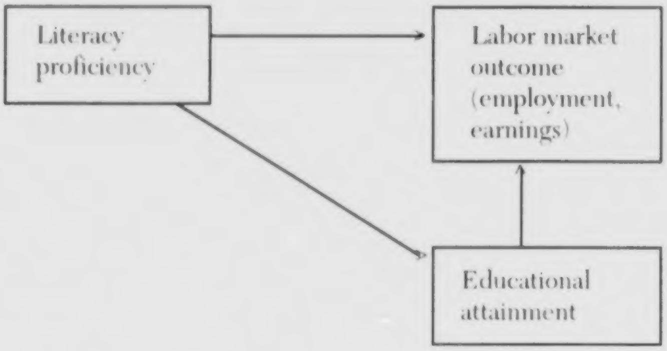
SOURCE: U.S. Department of Education, National Center for Education Statistics, National Adult Literacy Survey, 1992.

Estimating the Direct and Indirect Effects of Prose Proficiencies on Labor Market Outcomes

The multivariate statistical models that have been used thus far to identify the independent influence of literacy proficiencies on the labor force and employment status of 16- to 65-year-old respondents provide estimates only of their direct effects on each of the labor market outcomes, not their total effects. A number of the other human capital variables entered into these models as independent variables are themselves influenced by respondents' literacy proficiencies. This is particularly true of the formal schooling attainment variables (graduated from high school, completed some postsecondary schooling, obtained a two- or four-year degree) which were shown earlier (see Chapter Five) to be substantively influenced by literacy proficiencies. Adults with stronger prose, document, and quantitative proficiencies were significantly more likely than their less proficient peers to graduate from high school and complete some postsecondary schooling.[4]

The total effect of literacy proficiencies on any labor market outcome is, thus, equal to the sum of their direct and indirect effects (Figure 7.1). Adults' literacy skills can indirectly affect labor market outcomes by increasing the likelihood of their completing higher levels of formal schooling, which in turn positively and significantly affect their probability of being in the civilian labor force, being employed, working year-round, or achieving weekly earnings

Figure 7.1—Modeling the direct and indirect effects of literacy proficiencies on labor market outcomes for 16- to 65-year-olds: 1992



SOURCE: U.S. Department of Education, National Center for Education Statistics, National Adult Literacy Survey, 1992.

above the minimum earnings threshold. These indirect effects of higher literacy proficiencies on individual labor market outcomes can be estimated by combining the results of the earlier multivariate statistical models of the influence of literacy proficiencies on the educational attainment variables with the estimated coefficients of the formal schooling variables on the labor market outcomes being analyzed.[5] Or, as a close approximation to this statistical procedure, one can simply estimate the effects of higher prose, document, or quantitative proficiencies on each of the labor market outcomes in a model that excludes the formal schooling variables as predictors.[6]

Table 7.4 provides estimates of the expected influence of a 60-point increase in prose proficiencies on each of the six labor market outcomes in the linear probability models that excluded formal schooling variables as predictors. Each of these estimated coefficients is considerably higher than its value in the models capturing only the direct effects of higher prose proficiencies. For example, a 60-point increase in prose scores is now associated with an increase of nearly 8 percentage points in the likelihood of employment at the time of the survey, or 11 percent, an effect that is nearly twice as high as the direct effect alone (as shown in Table 7.1). Similarly, a 60-point increase in prose proficiency was associated with a decrease of 3.6

Table 7.4—Estimated direct and indirect effects of a 60-point increase in prose proficiency on the expected probability of labor market outcomes (excluding schooling variables as predictors): 1992

Labor market outcome	Absolute difference	Significance level of coefficient	Mean value of variable	Difference as percent of mean value
In the labor force*	.048	.01	.786	6
Unemployed*	-.036	.01	.081	-44
Employed*	.078	.01	.705	11
Employed full time*	.060	.01	.541	11
Employed full time, year-round last year	.060	.01	.433	14
Weekly earnings above poverty line**	.090	.01	.411	22

Notes: Age group = 16 to 65.

* At the time of the survey. ** For a four-person family; includes zero earners.

SOURCE: U.S. Department of Education, National Center for Education Statistics, National Adult Literacy Survey, 1992.

percentage points (or 44 percent) in the probability of being unemployed, an effect twice as high as that of the estimated direct effect only. Nearly identical results occur when the analysis is focused on the associations between higher prose proficiencies and the probability of full-time employment; of year-round, full-time employment; or of having weekly earnings above the four-person poverty line. The combined direct and indirect effects of higher proficiencies on labor market outcomes tend to be twice as high as the direct effect for most of these six outcomes.

Effects of Literacy Proficiencies on the Weekly Earnings of Full-time Workers

To the extent that they directly or indirectly raise worker productivity, the literacy proficiencies of employed respondents also would be expected to improve their weekly and annual earnings prospects. To estimate the independent contribution of higher literacy proficiencies to the weekly earnings of the full-time employed, the authors constructed a series of earnings functions in which weekly earnings in both absolute dollars and its natural log equivalent appear as the dependent variable. These earnings functions first were estimated for all full-time employed and then for sex, racial/ethnic, age, educational attainment, and occupational employment subgroups. The earnings models were estimated separately for the prose, document, and quantitative proficiency variables and for a composite proficiency variable (the mean of the three individual proficiency variables).

The findings of the analysis of the effects of prose proficiencies on the weekly earnings of the full-time employed are displayed in Tables 7.5 through 7.7. Table 7.5 presents the results for the earnings models in which the dependent variable is the absolute value of the gross weekly earnings of the full-time employed. For the entire sample, a 60-point increase in prose proficiencies, ceteris paribus, was associated with a gain of $82 in expected weekly earnings, or 17 percent of the mean weekly earnings of the full-time employed. Higher prose proficiencies were significantly associated with higher weekly earnings for both men and women. While the estimated absolute size of the effect of prose proficiencies on earnings is higher for men than for women ($93 versus $64), the relative size of the effect is somewhat higher for women than for men (18 percent versus 16 percent) due to women's lower mean weekly earnings.

Higher prose proficiencies were associated with significantly higher weekly earnings for both Black ($61) and White ($92) workers.[7] While the estimated effect was also positive for Hispanics ($31), the coefficient fell short

Table 7.5—Estimated effects of a 60-point increase in prose proficiency on the expected weekly earnings of the full-time employed, by sex, race/ethnicity, and age: 1992

Subgroup of the full-time employed	Absolute difference	Significance level of coefficient	Mean weekly earnings	Difference as percent of mean weekly earnings
All	$82	.01	$481	17
Sex				
Male	93	.01	589	16
Female	64	.01	354	18
Race/ethnicity				
White	92	.01	511	18
Black	61	.01	372	16
Hispanic	31	*	371	*
Age group				
16 to 24, all	5	*	220	*
16 to 24, not enrolled	8	*	271	*
25 to 34	48	.01	449	11
35 to 44	68	.01	574	12
45 to 54	137	.01	647	21
55 to 64	176	.01	578	30

Note: Age group = 16 to 65. * Not statistically significant at the .10 level.

SOURCE: U.S. Department of Education, National Center for Education Statistics, National Adult Literacy Survey, 1992.

of statistical significance at the .10 level. Many Hispanic workers were immigrants to the United States, and immigrants often have quite limited English literacy proficiencies. Newer arrivals may have greater difficulties in converting their literacy proficiencies into higher earnings. In a following set of earnings models, earnings functions are estimated separately for the native born and for subgroups of foreign-born immigrants based on their length of stay in the United States.

Full-time workers were divided into five age groups (age 16 to 24 to age 55 to 64). In addition, a separate earnings function was estimated for those 16- to 24-year-olds who were not enrolled in school at the time of the survey. Stronger prose proficiencies were associated with higher weekly earnings for all age subgroups of the full-time employed except for the youngest adults (age 16 to 24). Earlier analyses of the simple correlations between young adults' proficiencies and their earnings also revealed weak relationships. The absolute and relative size of the estimated effects of prose proficiencies on the earnings of adult workers (age 25 and older) rose continuously and sharply with age, ranging from $48 for full-time workers age 25 to 34 to $176 for those in the 55 to 64 age range.

Table 7.6—Estimated effects of a 60-point increase in prose proficiency on the expected weekly earnings of the full-time employed, by sex, race/ethnicity, and age (natural log of earnings model): 1992

Subgroup of the full-time employed	Difference as percent of mean weekly earnings	Significance level of coefficient
All	12	.01
Sex		
Male	11	.01
Female	13	.01
Race/ethnicity		
White	12	.01
Black	15	.01
Hispanic	5	.05
Age group		
16 to 24, all	-4	*
16 to 24, not enrolled	2	*
25 to 34	14	.01
35 to 44	11	.01
45 to 54	14	.01
55 to 64	17	.01

Note: Age group = 16 to 65. * Not statistically significant at the .10 level.

SOURCE: U.S. Department of Education, National Center for Education Statistics, National Adult Literacy Survey, 1992.

Table 7.7—Estimated effects of a 60-point increase in prose proficiency on the expected weekly earnings of the full-time employed, by educational attainment and occupational group (natural log of weekly earnings): 1992

Subgroup of the full-time employed	Difference as percent of mean weekly earnings	Significance level of coefficient
Educational attainment		
0 to 8 years	8	.01
9 to 12 years	3	*
High-school diploma or GED	11	.01
Some postsecondary	10	.01
Two-year degree or higher	17	.01
Occupation		
Professional, manager	14	.01
Technical	5	*
Sales, administrative support	11	.01
Services	7	.02
Craft	11	.01
Operator, assembler, fabricator, laborer, helper, farm, forestry, fishing	6	.01

Note: Age group = 16 to 65. * Not statistically significant at the .10 level.

SOURCE: U.S. Department of Education, National Center for Education Statistics, National Adult Literacy Survey, 1992.

The weekly earnings models were reestimated, using the natural log of the weekly earnings of the full-time employed as the dependent variable (Tables 7.6 and 7.7). For all full-time workers, a 60-point rise in prose proficiencies was associated with a 12 percent increase in expected weekly earnings.[8] The estimated effects of higher prose proficiencies on the weekly earnings of men and women were quite similar (11 percent for men and 13 percent for women). The weekly earnings of Blacks, Hispanics, and Whites also were significantly affected by their prose proficiencies; however, the estimated sizes of these earnings effects were higher for Blacks (15 percent) and Whites (12 percent) than for Hispanics (5 percent). Similar to the findings from the previous earnings model, full-time workers in each age group, with the exception of young adults below age 25, obtained significantly higher weekly earnings as their prose proficiencies increased, with the size of these effects ranging from 11 percent to 17 percent.

Full-time workers were classified into five educational attainment subgroups. With the exception of those workers who had completed some high school but failed to obtain a diploma or GED certificate, the weekly earnings of the full-time employed in each educational attainment subgroup were significantly affected by their prose proficiencies. The estimated sizes of these earnings effects varied by years of formal schooling completed, ranging from 8 percent for workers with only a primary education to 17 percent for those with a postsecondary degree. The best educated workers obtained higher economic payoffs from literacy proficiencies.

Full-time workers were divided into six major occupational clusters based on the occupational characteristics of the jobs they held at the time of the assessment (Table 7.7). With the exception of workers in technical occupations,[9] the weekly earnings of full-time workers in each major occupational cluster were positively and significantly associated with their prose proficiencies. The estimated sizes of these weekly earnings effects, however, varied fairly widely across the occupational clusters, ranging in value from 6 to 7 percent for semiskilled and unskilled blue-collar workers and service workers to 14 percent for professional and managerial workers. Stronger prose proficiencies yielded higher economic payoffs for workers with postsecondary degrees and those in professional or managerial positions. As revealed in Chapter Three, adults with advanced degrees and stronger literacy proficiencies were the most likely to hold professional and managerial positions. Stronger literacy skills, thus, increase individuals' access to higher level white-collar occupations and help those in such jobs to obtain significantly higher weekly earnings. Within professional and managerial occupations, higher prose proficiencies (as well as document and quantitative proficiencies) may raise weekly earnings both through a sorting process in which more literate workers end up in higher-paying occupations and through a job-specific productivity raising process; i.e., more literate workers within a given professional or management-related occupation (accountant, electronic engineer, teacher) are more productive and are compensated for their higher productivity through higher weekly earnings. Unfortunately, the survey data do not permit distinguishing between these two sources of earnings gains.

Comparing the Earnings Effects of Prose, Document, and Quantitative Proficiencies

Each of the earnings models used to estimate the independent effects of prose proficiencies also was used to estimate the weekly earnings effects of document and quantitative proficiencies (Tables 7.8 to 7.13). The patterns of the findings for the earnings models in which weekly earnings appear in their absolute dollar form are generally very similar to those for prose proficiencies. A 60-point increase in quantitative proficiencies was associated with an $82 gain in the expected weekly earnings of all full-time workers, an effect identical to that for prose proficiencies; however, a 60-point increase in document proficiencies was associated with only a $65 rise in expected weekly earnings, an effect about 20 percent less than that of prose and quantitative proficiencies. Higher

Table 7.8—Estimated effects of a 60-point increase in document proficiency on the expected weekly earnings of the full-time employed, by sex, race/ethnicity, and age: 1992

Subgroup of the full-time employed	Absolute difference	Significance level of coefficient	Mean weekly earnings	Difference as percent of mean weekly earnings
All	$65	.01	481	14
Sex				
Male	75	.01	589	13
Female	54	.01	354	15
Race/ethnicity				
White	79	.01	511	16
Black	58	.01	372	16
Hispanic	16	*	371	*
Age group				
16 to 24, all	5	*	220	*
16 to 24, not enrolled	12	.10	271	4
25 to 34	49	.01	449	11
35 to 44	52	.01	574	9
45 to 54	104	.01	647	16
55 to 64	151	.01	578	19

Note: Age group = 16 to 65. * Not statistically significant at the .10 level.

SOURCE: U.S. Department of Education, National Center for Education Statistics, National Adult Literacy Survey, 1992.

Table 7.9—Estimated effects of a 60-point increase in document proficiency on the expected weekly earnings of the full-time employed, by sex, race/ethnicity, and age (natural log of earnings model): 1992

Subgroup of the full-time employed	Difference as percent of mean weekly earnings	Significance level of coefficient
All	11	.01
Sex		
Male	10	.01
Female	13	.01
Race/ethnicity		
White	12	.01
Black	14	.01
Hispanic	4	.06
Age group		
16 to 24, all	-1	*
16 to 24, not enrolled	4	*
25 to 34	13	.01
35 to 44	10	.01
45 to 54	13	.01
55 to 64	17	.01

Note: Age group = 16 to 65. * Not statistically significant at the .10 level.

SOURCE: U.S. Department of Education, National Center for Education Statistics, National Adult Literacy Survey, 1992.

document and quantitative proficiencies significantly increased the weekly earnings of men and women and of Blacks and Whites. Their effects on the expected weekly earnings of Hispanics were positive but fell slightly short of statistical significance at the .10 level.

In contrast to the findings for prose proficiencies, the weekly earnings of young adults not enrolled in school were significantly associated with their document and quantitative proficiencies. The absolute sizes of the estimated effects of document and quantitative proficiencies on weekly earnings for this age group were $12 to $15, respectively, but considerably below those for older adults.

Table 7.10—Estimated effects of a 60-point increase in document proficiency on the expected weekly earnings of the full-time employed, by educational attainment and occupational group (natural log of weekly earnings): 1992

Subgroup of the full-time employed	Difference as percent of mean weekly earnings	Significance level of coefficient
Educational attainment		
0 to 8 years	11	.01
9 to 12 years	2	*
High-school diploma or GED	13	.01
Some postsecondary	11	.01
Two-year degree or higher	14	.01
Occupational group		
Professional, manager	13	.01
Technical	5	*
Sales, administrative support	8	.01
Services	7	.01
Craft	9	.01
Operator, assembler, fabricator, laborer, helper, farm, forestry, fishing	5	.01

Note: Age group = 16 to 65. * Not statistically significant at the .10 level.

SOURCE: U.S. Department of Education, National Center for Education Statistics, National Adult Literacy Survey, 1992.

When the natural log of weekly earnings was used as the dependent variable, document and quantitative proficiencies were found to significantly raise expected weekly earnings for all full-time employed by 11 percent and 12 percent, respectively (Tables 7.9 and 7.12). The findings by sex, race-ethnic origin, and age subgroup were quite similar to those for the prose scale. Non-enrolled young adults with higher quantitative proficiencies did receive modestly higher weekly earnings than their less proficient peers. Prose and document proficiencies were not associated with the weekly earnings of the youngest subgroup of the full-time employed, however.

Table 7.11—Estimated effects of a 60-point increase in quantitative proficiency on the expected weekly earnings of the full-time employed, by sex, race/ethnicity group, and age: 1992

Subgroup of the full-time employed	Absolute difference	Significance level of coefficient	Mean weekly earnings	Difference as percent of mean weekly earnings
All	$82	.01	$481	17
Sex				
Male	92	.01	589	16
Female	54	.01	354	15
Race/ethnicity				
White	95	.01	511	19
Black	57	.01	372	15
Hispanic	24	*	371	*
Age group				
16 to 24, all	8	*	220	*
16 to 24, not enrolled	15	.05	271	6
25 to 34	53	.01	449	12
35 to 44	65	.01	574	11
45 to 54	141	.01	647	22
55 to 64	154	.01	578	27

Note: Age group = 16 to 65. * Not statistically significant at the .10 level.

SOURCE: U.S. Department of Education, National Center for Education Statistics, National Adult Literacy Survey, 1992.

Again, similar to the earlier findings for prose proficiencies, most educational and occupational subgroups of the full-time employed did experience significantly higher weekly earnings as their document and quantitative proficiencies improved. The exceptions to this general pattern were high-school dropouts (whose earnings were positively associated with higher quantitative proficiencies) and technicians (Tables 7.10 and 7.13). The strength of the associations between document and quantitative proficiencies and weekly earnings of the full-time employed were highest for those with a postsecondary degree and for those in professional and managerial jobs.

Table 7.12—Estimated effects of a 60-point increase in quantitative proficiency on the expected weekly earnings of the full-time employed, by sex, race/ethnicity, and age (natural log of earnings model): 1992

Subgroup of the full-time employed	Difference as percent of mean weekly earnings	Significance level of coefficient
All	12	.01
Sex		
Male	11	.01
Female	13	.01
Race/ethnicity		
White	14	.01
Black	14	.01
Hispanic	4	.05
Age group		
16 to 24, all	-2	*
16 to 24, not enrolled	7	.02
25 to 34	14	.01
35 to 44	12	.01
45 to 54	16	.01
55 to 64	16	.01

Note: Age group = 16 to 65. * Not statistically significant at the .10 level.

SOURCE: U.S. Department of Education, National Center for Education Statistics, National Adult Literacy Survey, 1992.

Weekly Earnings and the Composite Literacy Proficiencies of the Full-time Employed

The above findings on the estimated influence of literacy proficiencies on the weekly earnings of the full-time employed have been based on models in which only one proficiency variable at a time was entered into the earnings model. Workers' earnings potential might well be expected to be influenced by their overall literacy proficiencies, i.e., prose, document, and quantitative together. While the correlations in proficiencies across the three scales are quite high, they are not perfect; thus, a composite measure of literacy proficiency was used to estimate the weekly earnings of all full-time employed adults.

Table 7.13—Estimated effects of a 60-point increase in quantitative proficiency on the expected weekly earnings of the full-time employed, by educational attainment and occupational group (natural log of weekly earnings): 1992

Subgroup of the full-time employed	Difference as percent of mean weekly earnings	Significance level of coefficient
Educational attainment		
0 to 8 years	9	.01
9 to 12 years	5	.06
High-school diploma or GED	13	.01
Some postsecondary	11	.01
Two-year degree or higher	17	.01
Occupational group		
Professional, manager	16	.01
Technical	7	*
Sales, administrative support	11	.01
Services	7	.01
Craft	10	.01
Operator, assembler, fabricator, laborer, helper, farm, forestry, fishing	7	.01

Note: Age group = 16 to 65. * Not statistically significant at the .10 level.

SOURCE: U.S. Department of Education, National Center for Education Statistics, National Adult Literacy Survey, 1992.

A 60-point increase in the composite literacy measure was found to be associated with a rise of nearly 14 percent in expected weekly earnings (Table 7.14). This estimated effect was higher than those for each of the three literacy proficiency variables alone (11 to 12 percent). Composite proficiencies of the full-time employed, thus, seem to be a somewhat more important determinant of their weekly earnings potential than any one of the three proficiencies alone.

Table 7.14—Comparisons of the estimated effects of a 60-point increase in prose, document, quantitative, and composite proficiencies on the expected percent increase in weekly earnings: 1992

Literacy scale	Percent increase in weekly earnings
Prose	12
Document	11
Quantitative	12
Composite	14

SOURCE: U.S. Department of Education, National Center for Education Statistics, National Adult Literacy Survey, 1992.

Direct and Indirect Effects of Literacy Proficiencies on Weekly Earnings

All of the preceding estimates of the effects of higher literacy proficiencies on the weekly earnings of adult workers represented their direct effects only. As noted earlier, adults' literacy proficiencies also had indirect effects on their earnings via their effects on the amount of formal schooling that they would complete. The amount of formal schooling obtained by workers significantly raised their expected earnings. For example, a full-time employee with a two-year degree earned approximately 20 percent more per week than their counterparts with only a high-school diploma while those persons holding a four-year degree had expected weekly earnings nearly 40 percent higher than those of high-school graduates. To capture the indirect effects of higher literacy proficiencies on weekly earnings, the coefficients of the literacy proficiency variables in each of the schooling outcome models described in Chapter Five were multiplied by the coefficients of the formal schooling variables in the weekly earnings models.

Findings for the combined direct and indirect effects of higher literacy proficiencies are displayed in Table 7.15. In the weekly earnings model in which the prose proficiency variable appeared as a predictor, the combined direct and indirect effect of literacy scores on weekly earnings was 24 percent, or twice as high as that of the direct effect only.[10] Nearly identical results prevailed for the document and quantitative proficiency variables. A one standard deviation increase in any of the three proficiency variables directly

Table 7.15—Comparing the direct effects with the combined direct and indirect effects of higher prose, document, and quantitative proficiencies on the weekly earnings of the full-time employed (natural log of weekly earnings as dependent variable): 1992

	Effect on weekly earnings (in percent)		
Type of effect	**Prose**	**Document**	**Quantitative**
Direct only	12	11	12
Direct and indirect	24	23	23
Direct and indirect as percent of direct	202	211	192

Note: Age group = 16 to 65

SOURCE: U.S. Department of Education, National Center for Education Statistics, National Adult Literacy Survey, 1992

and indirectly raised expected weekly earnings among the full-time employed by 23 to 24 percent, a very strong effect that was quite consistent across the three literacy scales.

Effects of Literacy Proficiencies on the Annual Earnings of Employed Adults

To identify the effects of the literacy proficiencies on the annual earnings of employed 16- to 65-year-olds, we estimated a series of earnings functions with annual earnings as the dependent variable. Separate earnings models were constructed to estimate the earnings effects of prose, document, quantitative, and composite proficiencies.

For the earnings model in which the absolute dollar amount of annual earnings was the dependent variable, a 60-point increase in prose proficiency raised expected earnings by $3,131, or nearly 15 percent of mean annual earnings (Table 7.16). Prose proficiencies also significantly improved expected earnings for men and women, for Whites, Blacks, and Hispanics, and for members of each age group, with the exception of adults younger than age 25. The relative size of the earnings effects of prose proficiencies exceeded 10 percent for each of these demographic subgroups, ranging to highs of 17 percent for women and 18 percent for 55- to 64-year-olds. In the annual earnings models for men, none of the race-ethnicity variables entered with a statistically significant coefficient.[11] In the same earnings models for women, the variable representing Black women entered with a positive statistically

Table 7.16—Estimated effects of a 60-point increase in prose proficiency on the expected annual earnings of the employed, by sex, race/ethnicity, and age: 1992

Subgroup of the employed	Absolute difference	Significance level of coefficient	Mean annual earnings	Difference as percent of mean annual earnings
All	$3,131	.01	$20,986	15
Sex				
Male	3,335	.01	25,912	13
Female	2,584	.01	15,304	17
Race/ethnicity				
White	3,181	.01	22,472	14
Black	2,157	.01	15,734	14
Hispanic	2,316	.01	15,132	15
Age group				
16 to 24, all	409	*	9,254	*
16 to 24, not enrolled	493	*	11,522	*
25 to 34	2,537	.01	20,930	12
35 to 44	2,908	.01	27,790	11
45 to 54	4,789	.01	30,859	16
55 to 64	4,783	.01	26,817	18

Note: Age group = 16 to 65. * Not statistically significant at the .10 level.

SOURCE: U.S. Department of Education, National Center for Education Statistics, National Adult Literacy Survey, 1992.

significant coefficient while those for Hispanics and other non-Whites are not significant.[12] These findings are quite important, implying that the annual earnings potentials of Blacks, Asians, and Hispanics were statistically identical to those of White, non-Hispanics when they entered the labor market with equal human capital, health, demographic, and socioeconomic traits. Literacy proficiencies, formal schooling, years of work experience, and health variables significantly improved the earnings prospects of the members of each major racial/ethnic group. Health variables refer to a lack of disability. In this case, not having a disability was associated with higher earnings prospects.

When the natural log of the annual earnings of employed respondents was used as the dependent variable, a 60-point increase in prose proficiencies was estimated to increase expected annual earnings for all employed 16- to 65-year-olds by nearly 14 percent (Table 7.17). Higher prose proficiencies increased the expected annual earnings of men and women, Whites, Blacks, and Hispanics, and members of each age subgroup, except young adults. The estimated sizes of these earnings effects were quite substantial, ranging in value from 13 percent to 17 percent across these demographic subgroups. Annual earnings models also were estimated for employed members of five educational subgroups. Prose proficiencies were positively and significantly associated with higher annual earnings for each of these subgroups, except those with zero to eight years of schooling for whom the estimated effect of higher prose

Table 7.17—Estimated effects of a 60-point increase in prose proficiency on the expected annual earnings of the employed, by sex, race/ethnicity, age, and educational attainment (natural log of earnings model): 1992

Subgroup of the employed	Difference as percent of mean annual earnings	Significance level of coefficient
All	14	.01
Sex		
Male	13	.01
Female	15	.01
Race/ethnicity		
White	13	.01
Black	15	.01
Hispanic	13	.01
Age group		
16 to 24, all	4	*
16 to 24, not enrolled	3	*
25 to 34	17	.01
35 to 44	13	.01
45 to 54	14	.01
55 to 64	16	.01
Educational attainment		
0 to 8 years	8	*
9 to 12 years	11	.01
High-school diploma or GED	11	.01
Some postsecondary	13	.01
Two-year degree or higher	19	.01

Note: Age group = 16 to 65. * Not statistically significant at the .10 level.

SOURCE: U.S. Department of Education, National Center for Education Statistics, National Adult Literacy Survey, 1992.

proficiencies fell slightly short of significance at the .10 level. Again, among all the educational subgroups, employed persons with postsecondary degrees received the highest annual earnings dividends from stronger prose proficiencies.

Each of the annual earnings models was reestimated, using document and quantitative proficiencies as the explanatory variable in place of prose proficiencies (Tables 7.18 to 7.21). The findings were generally quite consistent across the three literacy scales. A 60-point increase in any of these three literacy proficiencies raised expected annual earnings by 14 to 15 percent (Tables 7.17, 7.19, and 7.21).

The patterns of the estimated earnings effects across sex, racial/ethnic, age, and educational attainment subgroups were quite similar across the three

Table 7.18—Estimated effects of a 60-point increase in document proficiency on the expected annual earnings of the employed, by sex, race/ethnicity, and age: 1992

Subgroup of the employed	Absolute difference	Significance level of coefficient	Mean annual earnings	Difference as percent of mean annual earnings
All	$2,635	.01	$20,986	13
Sex				
Male	2,854	.01	25,912	11
Female	2,260	.01	15,304	15
Race/ethnicity				
White	2,690	.01	22,472	12
Black	2,123	.01	15,734	14
Hispanic	1,732	.01	15,132	8
Age group				
16 to 24, all	556	.10	9,254	6
16 to 24, not enrolled	706	.05	11,522	6
25 to 34	2,303	.01	20,930	11
35 to 44	2,233	.01	27,790	8
45 to 54	3,887	.01	30,859	13
55 to 64	3,236	.04	26,817	12

Note: Age group = 16 to 65

SOURCE: U.S. Department of Education, National Center for Education Statistics, National Adult Literacy Survey, 1992.

Table 7.19—Estimated effects of a 60-point increase in document proficiency on the expected annual earnings of the employed, by sex, race/ethnicity, age, and educational attainment (natural log of earnings model): 1992

Subgroup of the employed	Difference as percent of mean annual earnings	Significance level of coefficient
All	14	.01
Sex		
Male	14	.01
Female	13	.01
Race/ethnicity		
White	18	.01
Black	11	.01
Hispanic	13	.01
Age group		
16 to 24, all	5	*
16 to 24, not enrolled	6	*
25 to 34	16	.01
35 to 44	12	.01
45 to 54	14	.01
55 to 64	14	.02
Educational attainment		
0 to 8 years	10	.03
9 to 12 years	8	.02
High-school diploma or GED	14	.01
Some postsecondary	13	.01
Two-year degree or higher	16	.01

Note: Age group = 16 to 65. * Not statistically significant at the .10 level.

SOURCE: U.S. Department of Education, National Center for Education Statistics, National Adult Literacy Survey, 1992.

scales. There were only two substantive differences. First, higher quantitative proficiencies were associated with significantly higher annual earnings for young adults, though the relative size of the effect was typically less than half that of the older subgroups. Second, both document and quantitative proficiencies were positively and significantly associated with higher annual earnings among employed respondents with only a primary education. A 60-point improvement in document and quantitative proficiencies raised the expected annual earnings of the employed with only a primary school education by 10 and 8 percentage points, respectively. Across all three literacy scales, the estimated earnings effects of stronger proficiencies were highest for employed persons with at least a two-year degree.

Table 7.20—Estimated effects of a 60-point increase in quantitative proficiency on the expected annual earnings of the employed, by sex, race/ethnicity, and age: 1992

Subgroup of the employed	Absolute difference	Significance level of coefficient	Mean annual earnings	Difference as percent of mean annual earnings
All	$3,147	.01	$20,986	15
Sex				
Male	3,218	.01	25,912	12
Female	2,912	.01	15,304	19
Race/ethnicity				
White	3,226	.01	22,472	14
Black	2,120	.01	15,734	14
Hispanic	1,986	.01	15,132	13
Age group				
16 to 24, all	502	.10	9,254	5
16 to 24, not enrolled	611	.10	11,522	5
25 to 34	2,565	.01	20,930	12
35 to 44	2,998	.01	27,790	11
45 to 54	5,054	.01	30,859	16
55 to 64	3,837	.01	26,817	14

Note: Age group = 16 to 65.

SOURCE: U.S. Department of Education, National Center for Education Statistics, National Adult Literacy Survey, 1992.

Table 7.21—Estimated effects of a 60-point increase in quantitative proficiency on the expected annual earnings of the employed, by sex, race/ethnicity, age, and educational attainment (natural log of earnings model): 1992

Subgroup of the employed	Difference as percent of mean annual earnings	Significance level of coefficient
All	15	.01
Sex		
Male	15	.01
Female	14	.01
Race/ethnicity		
White	14	.01
Black	16	.01
Hispanic	13	.01
Age group		
16 to 24, all	7	.06
16 to 24, not enrolled	8	.07
25 to 34	17	.01
35 to 44	15	.01
45 to 54	16	.01
55 to 64	13	.01
Educational attainment		
0 to 8 years	8	.04
9 to 12 years	10	.01
High-school diploma or GED	14	.01
Some postsecondary	14	.01
Two-year degree or higher	19	.01

Note: Age group = 16 to 65.

SOURCE: U.S. Department of Education, National Center for Education Statistics, National Adult Literacy Survey, 1992.

Effects of Literacy Proficiencies on the Earnings of the Native and Foreign Born

Many foreign-born adults residing in the United States at the time of the survey had quite limited literacy proficiencies. A key question for human resource policy is whether the human capital characteristics of the employed foreign born, especially their English literacy proficiencies, do significantly improve their earnings prospects in United States labor markets. To identify the contribution of literacy proficiencies to the weekly and annual earnings of the native and foreign born, the authors estimated weekly and annual earnings models for the following three subgroups of the male employed:[13]

- Employed 16- to 65-year-old males who were native born
- Employed 16- to 65-year-old males who were born outside of the U.S. and had resided in the U.S. for 10 years or less
- Employed 16- to 65-year-old males who were born outside of the U.S., but had resided in the U.S. for more than 10 years

Weekly and annual earnings models (natural log of earnings) were estimated for each of the above three subgroups of employed males, using the prose, document, and quantitative proficiency variables as separate predictor variables.[14] In the weekly earnings models, higher proficiencies on each of the three scales were associated with higher earnings among the native and foreign born with more than 10 years of residency in the United States, but were not associated with higher earnings among more recent immigrants (Table 7.22). For example, a 60-point increase in the prose proficiencies of the full-time employed would have raised the expected weekly earnings of native-born males by 13 percent and of the foreign born with more than a decade of residency by 12 percent. The estimated effects for these two groups were statistically identical. Similar results applied to the findings for document and quantitative proficiencies.

Table 7.22—Estimated effects of a 60-point increase in proficiency on the expected percent increase in the weekly earnings of male full-time employees by country of birth, by literacy scale (natural log of weekly earnings as dependent variable): 1992

Literacy scale/country of birth/ years lived in the U.S	Difference as percent of mean weekly earnings	Significance level of coefficient
Prose		
Born in the United States	13	.01
Born in another country		
lived in U.S. 10 years or less	4	*
lived in U.S. more than 10 years	12	.01
Document		
Born in the United States	11	.01
Born in another country		
lived in U.S. 10 years or less	2	*
lived in U.S. more than 10 years	11	.01
Quantitative		
Born in the United States	13	.01
Born in another country		
lived in U.S. 10 years or less	3	*
lived in U.S. more than 10 years	13	.01

Note: Age group = 16 to 65. * Not statistically significant at the .10 level.

SOURCE: U.S. Department of Education, National Center for Education Statistics, National Adult Literacy Survey, 1992.

Employed foreign-born male residents with longer stays in the United States seem to receive as high an economic payoff from improved literacy proficiencies as do the native born. More recent immigrants, however, who had the lowest mean literacy proficiencies, appeared to receive no significant earnings payoff from higher proficiencies, though they do benefit from more formal schooling and improved English-speaking abilities. As these relatively recent immigrants gain more work experience in this country and become more occupationally mobile, they may be able to secure higher earnings premiums for their literacy proficiencies.

Table 7.23—Estimated effects of a 60-point increase in proficiency on the expected annual earnings of employed males, by native born/foreign born status, by literacy scale

Literacy scale/country of birth/ years lived in the U.S	Difference as percent of mean annual earnings	Significance level of coefficient
Prose		
Born in the United States	14	.01
Born in another country		
lived in U.S. 10 years or less	-1	*
lived in U.S. more than 10 years	18	.01
Document		
Born in the United States	15	.01
Born in another country		
lived in U.S. 10 years or less	-4	*
lived in U.S. more than 10 years	14	.01
Quantitative		
Born in the United States	15	.01
Born in another country		
lived in U.S. 10 years or less	-2	*
lived in U.S. more than 10 years	16	.01

Note: Age group = 16 to 65. * Not statistically significant at the .10 level.

SOURCE: U.S. Department of Education, National Center for Education Statistics, National Adult Literacy Survey, 1992.

The estimated effects of literacy proficiencies on the annual earnings of the native and foreign born were quite similar to those for weekly earnings (Table 7.23). Higher prose, document, and quantitative scores significantly improved the annual earnings of the native born and of the foreign born who have lived in the United States for more than 10 years. For example, a 60-point increase in quantitative proficiency was associated with a 15 percent increase in the annual earnings of the native born and a 16 percent increase in earnings among the longer-stay foreign born; however, such a proficiency gain had no significant effect on the expected annual earnings of more recent male immigrants. Again, the economic benefits of higher proficiencies for recent immigrants may well improve over time as they acquire more work experience and sort themselves among different occupations and industries. Many of these recent immigrants (especially those with low proficiencies) occupied low-skill jobs where domestic United States workers have fared least well in terms of real wages and earnings.

Effects of Composite Literacy Proficiency on Earnings

The composite literacy variable (the mean of the three individual literacy proficiency scores for each respondent) was introduced into the model designed to explain annual earnings for the entire group of 16- to 65-year-olds who were employed in the year before the assessment. The findings of this analysis revealed that a 60-point increase in one's composite literacy score would raise expected annual earnings by nearly 17 percent (Table 7.24). This estimated earnings effect was 3 percentage points higher than that of prose and document proficiencies and nearly 2 percentage points higher than that of quantitative proficiency. Employed adults with higher composite literacy proficiencies clearly achieved substantially higher annual earnings. For the entire sample of employed respondents, the effect of a 60-point higher composite proficiency on mean annual earnings was equal to approximately $3,525.

Table 7.24—Comparisons of the estimated effects of a 60-point increase in literacy proficiencies on the expected percent increase in annual earnings of the employed, by literacy scale: 1992

Literacy scale	Effect as percent of mean annual earnings
Prose	14
Document	14
Quantitative	15
Composite	17

Note: Age group = 16 to 65

SOURCE: U.S. Department of Education, National Center for Education Statistics, National Adult Literacy Survey, 1992.

Estimating the Combined Direct and Indirect Effects of Literacy Proficiencies on Annual Earnings

All of the preceding estimates of the effects of literacy proficiencies on the annual earnings of employed adults represented their direct effects only. As noted in the earlier discussions of the effects of literacy proficiencies on weekly earnings, literacy skills also influence earnings via their effects on other human capital variables, including formal schooling and work experience. Estimates of the indirect effects of higher scores on annual earnings via their influence on the formal schooling of adults were generated for each of the three proficiency variables.[15] The combined direct and indirect effects of higher proficiencies on annual earnings were quite substantial, double the size of the direct effects only (Table 7.25). For example, a 60-point increase in prose proficiencies would raise expected annual earnings both directly and indirectly by nearly 31 percent versus a direct effect of only 14 percent. Nearly identical results prevailed for the document and quantitative proficiency variables. The annual economic value of the direct and indirect effects of higher prose and quantitative proficiencies was equal to nearly $6,300 valued at the mean annual earnings for all employed persons. Over a 40-year working life, assuming no further secular increase in the economic payoff to literacy proficiencies, these higher scores (60 points on a composite scale) would generate more than $250,000 in additional lifetime earnings.

Table 7.25—Comparing the direct effect with the combined direct and indirect effects of higher literacy proficiencies on the annual earnings of the employed, by literacy scale (natural log of annual earnings as the dependent variable): 1992

	Percent effect on annual earnings		
Type of effect	**Prose**	**Document**	**Quantitative**
Direct only	14	14	15
Direct and indirect	31	28	30
Direct and indirect as percent of direct	222	200	199

Note: Age group = 16 to 65.

SOURCE: U.S. Department of Education, National Center for Education Statistics, National Adult Literacy Survey, 1992.

Intensity of Use of Writing and Mathematics Skills and the Effects of Literacy Proficiencies on Earnings

Chapter Four examined relationships between respondents' literacy proficiencies, the intensity of their use of reading, writing, and mathematics skills on the job, and their annual earnings. The findings of a three-way analysis revealed that, given a worker's level of prose, document, or quantitative proficiency, those who applied reading, writing, and mathematics skills more frequently on the job obtained substantially higher mean annual earnings.

To test the importance of the intensity of reading, writing, and mathematics skills use for the expected earnings of employed respondents, the authors included three additional variables in the weekly and annual earnings equations for the employed. In the earnings models in which prose proficiency appeared as a predictor variable, either the variable READINT or PRINTINT was entered into the earnings model, together with the prose proficiency variable. The variable READINT is an interaction term representing the product of the prose proficiency score and the average intensity with which reading skills were applied on the job during a given week. The intensity variable ranged in value from 1 (never or less than once a week) to 5 (every day). The variable PRINTINT represented the interaction between one's estimated prose proficiency and the frequency with which writing skills were used on the job.[16] In the earnings models containing the quantitative proficiency variable, a new variable (MATHINT) was included as an additional predictor, to represent the interaction between quantitative skills and the frequency with which math skills were used on the job.[17]

Findings of the multivariate statistical analyses revealed that the intensity of use of reading, writing, and mathematics skills on the job significantly increased the expected economic payoff from prose and quantitative proficiencies (Table 7.26). A 60-point increase in prose skills combined with daily use of reading skills raised expected weekly earnings directly by 18 percent, while applying reading skills only once per week or less increased expected weekly earnings by only 9 percent. In the case of annual earnings, the differences were substantially larger. The personal economic payoffs from a 60-point higher prose score were 28 percent and 5 percent for the above two use intensities, respectively.

The intensity with which writing skills were used on the job also had a substantial effect on the estimated earnings effects of prose proficiencies. A 60-point increase in prose scores would raise expected weekly earnings by 17 percent if writing skills were applied daily on the job, but only by 10 percent if such skills were used less than once per week. In the annual earnings model, the estimated return to a 60-point increase in prose proficiencies was 23 percent if writing skills were used daily, but only 6 percent if they were used less than once per week.

Table 7.26—Estimated effect of a 60-point increase in proficiency on the expected weekly and annual earnings of the employed, by intensity of use of reading, writing, and mathematics skills at work (earnings variables in natural log form): 1992

	Effect on earnings for those who use their reading skills...		
Prose scale/ earnings variable	**Every day**	**Several times a week**	**Once a week or less**
Weekly earnings	18	14	9
Annual earnings	28	16	5

	Effect on earnings for those who use their writing skills...		
Prose scale/ earnings variable	**Every day**	**Several times a week**	**Once a week or less**
Weekly earnings	17	13	10
Annual earnings	23	15	6

	Effect on earnings for those who use their mathematics skills...		
Quantitative scale/ earnings variable	**Every day**	**Several times a week**	**Once a week or less**
Weekly earnings	15	12	11
Annual earnings	18	11	4

Note: Age group = 16 to 65.

SOURCE: U.S. Department of Education, National Center for Education Statistics, National Adult Literacy Survey, 1992.

Higher mathematics proficiencies also yield higher economic payoffs to employed respondents when they are applied more frequently on the job. A 60-point higher quantitative proficiency raised expected weekly earnings by 15 percent if mathematics skills were applied daily on the job, but by only 10 percent if they were used only once or less per week. In the annual earnings model, these estimated effects were 18 percent and 4 percent, respectively. Clearly, stronger literacy and numeracy proficiencies yield consistently greater earnings benefits to workers when the jobs they hold require them to use their skills often on the job. Efforts to raise the future real earnings of U.S. workers will, thus, have to simultaneously improve their literacy and technical skills and increase the skill requirements of available jobs to guarantee that an increased supply of such skills will be matched by a sufficient increase in the demand for them by the nation's employers, both public and private.

Effects of Literacy Proficiencies on the Poverty, Dependency, and Disability Status of Adults

The last set of variables for which the effects of literacy proficiencies were estimated included the poverty, cash public assistance income, and disability status of respondents (or their families) at the time of the National Adult Literacy Survey. Both the direct and the combined direct and indirect effects of increased proficiencies were estimated.[18] The three variables comprising the dependent variables in this analysis were the following:

- The poverty/near poverty status of the household in which the respondent was residing at the time of the assessment. If the respondent was living by himself, then the poverty/near poverty income threshold was 125 percent of the poverty line for a one-person household.

- A variable indicating whether or not the respondent's household received some form of cash public assistance income (Aid to Families with Dependent Children, Supplemental Security Income or General Relief) in the 12-month period prior to the assessment.

- A variable indicating whether the respondent had a physical or mental disability that limited her or him from fully participating in work, school, home, or other activities.

Higher prose, document, and quantitative proficiencies were associated with a lower incidence of poverty and of disability problems (Table 7.27). For example, a 60-point increase in prose proficiency decreased the likelihood of being a member of a household with an income below 125 percent of the poverty line by 2 percentage points, or 10 percent. Such individuals also were 21 percent less likely to be in a household receiving some form of cash public assistance income and 52 percent less likely to report themselves as having a disability or health condition that limited their ability to work, attend school, or engage in everyday activities. The findings are quite similar for the document and quantitative proficiency variables; however, these variables have a slightly higher (one-third) estimated effect on the probability of being poor or near poor.

Table 7.27—Estimated effects of a 60-point increase in literacy proficiency on the expected probability of being poor or near poor, receiving cash public assistance, or being disabled, by literacy scale: 1992

Literacy scale/ subgroup	Absolute difference	Significance level of coefficient	Mean value of variable	Difference as percent of mean value
Prose				
Poor or near poor	-.018	.01	.175	-10
Received cash public assistance	-.030	.01	.140	-21
Disabled	-.042	.01	.080	-53
Document				
Poor or near poor	-.024	.01	.175	-14
Received cash public assistance	-.030	.01	.140	-21
Disabled	-.036	.01	.080	-45
Quantitative				
Poor or near poor	-.024	.01	.175	-14
Received cash public assistance	-.030	.01	.140	-21
Disabled	-.042	.01	.080	-53

Note: Age group = 16 to 65.

SOURCE: U.S. Department of Education, National Center for Education Statistics, National Adult Literacy Survey, 1992.

The combined direct and indirect effects of higher literacy proficiencies on the likelihood of being poor or near poor or dependent on cash public assistance income were substantially higher than the direct effects above (Table 7.28). A 60-point increase in prose, document, or quantitative proficiencies was associated with a decline of 31 percent in the probability of being poor or near poor, an effect nearly three times as high as that of the direct effect alone. A 60-point increase in any of these three proficiencies was also associated with a reduction of 43 percent in the likelihood of being dependent on cash public assistance income, an effect twice as high as that of the direct effect alone. Both directly and indirectly, through their influence on adults' level of formal schooling, higher literacy proficiencies seem to be potentially powerful tools for reducing future poverty and welfare dependency among the nation's adults. National evaluations of educational programs for AFDC recipients suggest, however, that literacy efforts and GED programs need to be complemented by intensive job development and placement services to be successful in raising the employability and earnings of welfare recipients.

Table 7.28—Estimated direct and indirect effects of a 60-point increase in literacy proficiency on the expected probability of being poor or near poor, receiving cash public assistance, or being disabled, by literacy scale: 1992

Literacy scale/ subgroup	Absolute difference	Significance level of coefficient	Mean value of variable	Difference as percent of mean value
Prose				
Poor or near poor	-.054	.01	.175	-31
Received cash public assistance	-.060	.01	.140	-43
Disabled	-.054	.01	.080	-68
Document				
Poor or near poor	-.054	.01	.175	-31
Received cash public assistance	-.060	.01	.140	-43
Disabled	-.054	.01	.080	-68
Quantitative				
Poor or near poor	-.054	.01	.175	-31
Received cash public assistance	-.060	.01	.140	-43
Disabled	-.054	.01	.080	-68

Note: Age group = 16 to 65.

SOURCE: U.S. Department of Education, National Center for Education Statistics, National Adult Literacy Survey, 1992.

Endnotes

1. The exclusion of prison inmates from this labor market analysis is clearly justified. The very limited degree of labor force attachment among the nation's older adults (those age 65 and older) also warrants leaving them out of the analysis. At the time of the National Adult Literacy Survey, only one of six persons age 65 and older was actively participating in the civilian labor force versus nearly five of every six persons between the ages of 16 and 64. According to the findings of the 1992 Current Population Survey, only 12 percent of the nation's older adults were either working or looking for work during a typical month. See: U.S. Bureau of Labor Statistics, *Employment and Earnings*, January 1993, "Table 3", p. 174.

2. The titles and definitions of all dependent and independent variables appearing in the multivariate analysis are displayed in Appendix 7A at the end of this chapter.

3. In estimating the parameters of the model of weekly earnings above the poverty line, sample cases included respondents who were working at the time of the assessment as well as those who were jobless. Jobless respondents were assigned a weekly earnings value of zero.

4. The prose, document, and quantitative proficiencies of 22- to 65-year-old adults were found to substantially increase their likelihood of graduating from high school, completing one or more years of postsecondary schooling, obtaining a two-year degree or higher, and obtaining a four-year degree or higher. The estimated sizes of the effects of a 60-point increase in any of these three proficiencies on the likelihood of achieving the above educational outcomes were quite similar.

5. For example, the indirect effect of a 60-point increase in one's quantitative proficiency on the probability of being employed at the time of the survey would be equal to the sum of the products of the effect of a 60-point proficiency increase on each of the educational outcome variables and the estimated coefficients of these educational variables on the expected probability of employment. The higher the estimated independent effects of formal schooling on the labor market outcome, the higher the estimated indirect effects of the proficiency variables.

6. The exclusion of the formal educational variables from the multivariate statistical models of labor market outcomes does result in an "omitted variables" problem which can yield biased coefficients. The coefficients of the literacy proficiency variables in such models will, however, capture both their direct effects on the labor market outcome variables in the more fully specified model and their indirect effects on such outcomes via their influence on formal schooling. The omitted variable problem can be formulated in the following manner:

$$W = a + bL + cS$$

where
W = weekly earnings
L = literacy proficiency variable
S = years of schooling completed
b = estimated effect of a one-unit change in literacy on weekly earnings
c = estimated effect of an additional year of schooling on weekly earnings

Now let S be omitted from the model; thus, we estimate

$$W = a' + b' L$$

$$b' = b + c\,d_{sl}$$

where d_{sl} = the coefficient on L in a regression of S on L.

Since c is positive (formal schooling increases weekly earnings) and d_{sl} is also positive since higher literacy proficiencies increase schooling attainment, then b' is greater than b. The coefficient d_{sl} represents the estimated effect of the literacy proficiency variables on years of schooling completed. The term $c \cdot d_{sl}$, thus, represents the indirect effect of literacy proficiencies on weekly earnings.

7. The Black and White groups exclude Hispanics from the totals.

8. These estimates were derived by multiplying the coefficient on the prose variable by 60 since the prose variable was entered into the earnings model in its continuous form. In a multivariate statistical model in which the dependent variable appears in natural log form, the coefficient on a continuous variable

represents the expected percentage change in earnings from a one unit change in the explanatory variable.

9. The coefficient of the prose variable in the weekly earnings model for technicians was positive but fell somewhat short of statistical significance at the .10 level. The technicians group was the smallest of the six occupational clusters shown in Table 7.1. There were only 400 to 500 cases of full-time workers in technical occupations.

10. To capture the direct and indirect effects of higher proficiencies on weekly earnings in one model, the weekly earnings equations also were estimated after excluding the formal schooling variables as predictors. The estimated effect of a 60-point increase in the prose proficiency variable on the weekly earnings variable under this approach was 26 percent, again more than double the direct effect of prose proficiencies. Nearly identical results prevailed for the document and quantitative proficiency variables.

11. The coefficients on the Black, Hispanic, and Asian variables in the male annual earnings equation are generally negative, but they fall short of statistical significance at the .05 level even if one applied a one-tailed test to the findings. Their estimated sizes are also frequently quite small, being equal to only 4 percent of the mean annual earnings of all men.

12. The size of the Black coefficient in each of the three female annual earnings models (prose, document, and quantitative) ranges in absolute value from $2,300 to $2,500. Since annual hours of work for Black women often slightly exceed those of White women, part of this effect of race may be due to longer annual hours of work. Controlling for annual weeks worked, however, did not eliminate the positive sign of the Black coefficient in the annual earnings model.

13. There were slightly more than 1,200 foreign-born respondents age 16 to 65 who were employed full time when the assessment was conducted. Of this group, approximately 700 had lived in the U.S. for more than 10 years, and 500 had resided in the U.S. for 10 years or less. The employed foreign-born sample included approximately equal numbers of men and women.

14. For female immigrants who had lived in the U.S. for 10 or more years, not one of the literacy proficiency variables significantly affected their weekly or annual earnings.

15. The earlier analyses of the effects of literacy proficiencies on the employment status of respondents at the time of the survey and during the prior year revealed that stronger proficiencies consistently and significantly raised the probability of an individual being employed, working full time, or working year round. Individuals with stronger proficiencies should, thus, acquire more years of work experience over their working lives, which also raise their expected lifetime earnings. The indirect effects of higher literacy proficiencies on earnings via their effect on work experience unfortunately cannot be captured with the National Adult Literacy Survey data since the questionnaire did not collect information on actual years of work experience. The authors used a proxy for potential years of general work experience in the earnings model.

16. One background question asked respondents how often they wrote letters or memos, forms, and reports or articles on a weekly basis on their job. The response categories ranged from 1 (every day) to 5 (never). The writing intensity variable was calculated as the mean of these three responses.

17. One background question asked respondents how often they used mathematics skills on the job. The allowable responses ranged from 1 (every day) to 5 (never).

18. The combined direct and indirect estimates of increased proficiencies were based on the models of poverty, dependency, and disability outcomes in which the formal schooling variables were excluded from the analysis.

APPENDIX 7A

Definitions of Labor Market, Earnings, and Income Variables

The National Adult Literacy Survey background questionnaire collected information on an array of labor force, employment, earnings, and income variables, including current labor force activities, current and recent employment and earnings experiences, occupational and industrial characteristics of jobs held, personal and household incomes, and household sources of income in the past 12 months. This information was used to construct the 11 dependent variables used in the multivariate statistical analysis (Table 7A.1).

Five of these variables represent either the labor force, employment, and unemployment status of respondents at the time of the interview or their employment experiences in the 12-month period immediately prior to the survey. The point-in-time labor force activity measures include such traditional variables as respondents' civilian labor force participation status, their employment and unemployment status, and their full-time employment status. The final employment variable represents the full-time, year-round employment status of respondents in the prior 12 months. Respondents who were employed (including paid vacations and sick leave) for 50 or more weeks and worked an average of 35 or more hours per week were classified as "employed full time, year-round". All of these labor force and employment variables are dichotomous; that is, they have possible values of one or zero.

Three key earnings variables also were included in the multivariate analysis. Two (weekly earnings and annual earnings) are continuous variables, while the third is dichotomous, representing whether or not the respondent was earning at least $250 per week at the time of the survey. The continuous weekly earnings variable represents the gross weekly earnings, including tips and commissions, of respondents who were employed full time when the survey was conducted. It appears as a dependent variable in two different forms: absolute dollar terms and its natural log equivalent. Since the distribution of many earnings variables tends to be approximately log normal, this latter specification is preferred by many labor and human capital economists.[41] The continuous annual earnings variables represent the gross annual earnings of respondents who were employed during the previous 12

Table 7A.1.—Dependent variables used in the multivariate statistical analysis

Labor force and employment variables
- Civilian labor force status of respondents at the time of the survey
- Unemployment status of respondents at the time of the survey
- Employment status of respondents at the time of the survey
- Full-time employment status of respondents at the time of the survey
- Full-time, year-round employment status of respondents in the 12 months before the survey

Earnings variables
- Weekly earnings above the poverty line for a four-person family at the time of the survey
- Weekly earnings of respondents employed full-time at the time of the survey
- Annual earnings of respondents employed during the 12 months before the survey

Poverty/near poverty, public assistance, disability variables
- Poor/near poor status of respondent's family at the time of the survey
- Public assistance income status of respondents' household at the time of the survey
- Disability status of respondents at the time of the survey

SOURCE: U.S. Department of Education, National Center for Education Statistics, National Adult Literacy Survey, 1992.

months, regardless of their weeks or hours of employment. This earnings variable also appears in both absolute dollar terms and natural log form. The final earnings variable is a dichotomous variable that takes on the value of one if the respondent was earning $250 or more per week at the time of the assessment. The $250 weekly earnings standard was approximately equivalent to the gross earnings needed each week for a family of four to achieve an annual earnings level high enough to raise it above the federal government's official poverty line.[A2]

The last three dependent variables in the analysis include the poverty/near poverty status of respondents' families, their cash public assistance status in the 12 months before the survey, and their disability status at the time of the survey. Data on total household income and the number of household members were combined to determine whether the household's income exceeded 125 percent of the official poverty line.[A3] Respondents were asked to identify whether they or other members of their family had received various types of transfer, retirement, or property income during the previous 12 months. Persons who said they had received cash transfer income from the Aid to Families with Dependent Children (AFDC) program, state and local public assistance programs, or Supplemental Security Income (SSI) programs for the aged and disabled were classified as cash public assistance income recipients. Finally, respondents who identified themselves as having a "physical, mental, or other health condition" that prevented them from "participating fully in work, school, housework, or other activities" were categorized as disabled at the time of the survey. A disabled individual could have been working or looking for work at the time of the survey.

The background questionnaire also collected data on respondents' demographic and socioeconomic characteristics and their schooling histories. The multivariate statistical models incorporated many of these background variables as independent variables, including standard demographic information (gender, age, race/ethnicity, marital status), nativity status, health status, geographic area of residence, formal schooling attainment, English speaking proficiency, and literacy proficiencies (Table 7A.2).[A4] In most models, the prose, document, and quantitative proficiency variables appeared one at a time rather than simultaneously. In a few cases, an average composite

Table 7A.2.—Independent variables used in the multivariate statistical analysis

Demographic, socioeconomic variables
- Sex
- Age
- Race/ethnic origin
- Marital status
- Foreign birth status/length of residency in U.S.

Health, geographic variables
- Physical/mental disability status at time of assessment
- Geographic region of residence

Human capital variables
- Highest level of education attained
- School enrollment status at time of assessment
- English-speaking proficiency (self-reported)
- Prose proficiency
- Document proficiency
- Quantitative proficiency
- Average proficiency on the three literacy scales
- Intensity with which literacy skills were used on the job

SOURCE: U.S. Department of Education, National Center for Education Statistics, National Adult Literacy Survey, 1992.

proficiency score was calculated for each respondent by dividing the sum of the estimated prose, document, and quantitative proficiencies by three.

The estimated prose, document, and quantitative scores of each adult were entered into the models in continuous form. The estimated coefficients for each of these literacy variables, thus, represent the expected effect on the dependent variable from each one-point increase in proficiency, holding all other variables constant. Typically, each of the estimated coefficients was multiplied by 60 to depict the expected change in the dependent variable from approximately a one standard deviation increase in prose, document, or quantitative proficiency. The estimated standard deviations of the literacy scores of the nation's 16- to 65-year-olds ranged from 63 to 66 points on the three scales (Table 7A.3). As noted earlier, the estimated size of these standard deviations in scores varied by educational attainment subgroup. Adults who had earned a two- or four-year degree were characterized by the lowest amount of dispersion in literacy proficiencies.

Table 7A.3.—Estimated standard deviations of literacy proficiencies of 16- to 65-year-olds, by literacy scale and by educational attainment: 1992

Highest level of education attained	Standard deviations for each literacy scale Prose	Document	Quantitative
0 to 8 years	66	65	71
9 to 12 years, no diploma or GED	54	56	58
High-school diploma, GED	47	48	50
Some postsecondary	46	47	49
Two-year degree or higher	44	44	46
All	63	63	66

SOURCE: U.S. Department of Education, National Center for Education Statistics, National Adult Literacy Survey, 1992.

Endnotes

A1. For a review of the theoretical foundations, construction, use, and interpretation of human capital earnings models, see: (i) Jacob Mincer, *Schooling, Experience, and Earnings*, Columbia University Press for National Bureau of Economic Research, New York, 1974; (ii) S.W. Polachek and W.S. Siebert, *The Economics of Earnings*, Cambridge University Press, New York, 1993.

A2. During 1991, the weighted average poverty threshold for a family of four was $13,924. A family with one or more children under age 18 earning $250 per week for 52 weeks would have received $13,000 in gross earnings and would have been eligible for an Earned Income Tax Credit sufficiently high to have raised it above the official poverty line. For a review of recent legislative changes in the Earned Income Tax Credit provisions, see: Center on Budget and Policy Priorities, *The Earned Income Credit Provisions of the New Budget Law*, Washington, D.C., 1993.

A3. Because the NALS background questionnaire did not collect information on the relationship of the respondent to all other members of the household, the authors had to assume that all other household members were related to the respondent and formed a "family household" in accord with conventional Census Bureau definitions. For persons living in non-family households, the U.S. Census Bureau treats each individual as a "family of one" in determining their poverty status. See: U.S. Census Bureau, *Current Population Reports, Consumer Income, Series P-60, No. 181, Poverty in the United States: 1991*, U.S. Government Printing Office, Washington, D.C., 1992.

A4. The age variables were entered into the regression models in several different forms. In the case of the labor market and income models, the age variables appeared in categorical form representing different age groups. In the earnings models, age appeared in a modified continuous form together with an age squared variable constructed to represent years of potential work experience, a standard practice in human capital earnings models. See: S.W. Polachek and W.S. Siebert, op. cit.

APPENDIX 7B

Supplementary Tables

Related to Tables 7.1, 7.2, and 7.3—Findings of the multivariate statistical analysis of the influence of prose, document, and quantitative proficiencies on the probability of an adult being a labor force participant at the time of the survey: 1992

Independent Variables	Prose	Document	Quantitative
CONSTANT	.612°°° (20.08)	.613°°° (21.40)	.618°° (19.22)
AGE2	.156°°° (13.51)	.156°°° (13.46)	.156°°° (13.45)
AGE3	.167°°° (13.24)	.169°°° (13.33)	.167°°° (13.18)
AGE4	.158°°° (11.26)	.161°°° (11.46)	.157°°° (11.19)
AGE5	-.026° (-1.76)	-.022 (1.50)	-.029° (1.73)
FEMALE	-.173°°° (24.05)	-.171°°° (23.80)	-.168°°° (23.29)
BLACK	-.004 (.38)	-.003 (.26)	-.001 (.07)
HISP	-.004 (.31)	-.005 (.36)	-.004 (.25)
ASIAN	-.073°° (2.54)	-.075°°° (2.62)	-.079°°° (2.77)
OTHER	.007 (.26)	.007 (.25)	.008 (.30)
ENROLLED	-.035°°° (2.86)	-.034°°° (2.82)	-.033°°° (2.72)
ED1	-.077°°° (4.38)	-.077°°° (4.38)	-.077°°° (4.25)
ED2	-.021°° (1.71)	-.022°° (1.76)	-.020°° (1.67)
ED3	-.007 (.40)	-.007 (.38)	-.007 (.39)
ED5	.033°°° (2.82)	.034°°° (2.92)	.034°°° (2.85)
ED6	.015 (.97)	.015 (.97)	.016 (1.02)
ED7	.038°°° (2.76)	.040°°° (2.99)	.040°°° (3.00)
ED8	.043°°° (2.90)	.046°°° (3.16)	.047°°° (3.21)
DISAB	-.298°°°(-21.72)	-.299°°° (21.82)	-.297°°° (21.62)
REGION 2	.015 (1.37)	.016 (1.43)	.015 (1.40)
REGION 3	.017° (1.68)	.018° (1.74)	.017° (1.73)
REGION 4	.033°°° (2.94)	.035°°° (3.08)	.034°°° (3.08)
NONENG	.029 (1.24)	.027 (1.17)	.026 (1.08)
FOR5	-.076°°° (2.85)	-.077°°° (2.89)	-.080°°° (3.01)
FOR6	.007 (.43)	.006 (.35)	.003 (.20)
MARABS	.043 (1.44)	.042 (1.41)	.043 (1.43)
SEPDIV	.060°°° (5.40)	.061°°° (5.44)	.061°°° (5.46)
SINGLE	.028°°° (2.63)	.026°°° (5.43)	.029°°° (2.75)
PARTNER	.082°°° (3.67)	.079°° (2.49)	.082°°° (3.67)
PROFICIENCY	.0005°°° (5.74)	.0005°°° (6.14)	.0005°°° (5.08)
N	11,120	11,120	11,120
R^2	.164	.164	.164
F	72.63	72.68	72.66
SIG of F	.001	.001	.001

Notes: Age group = 16 to 65. Results are for both sexes combined. T-statistics are in parentheses. N = effective sample size. R^2 data are adjusted.

°°° .01 significance. °° .05 significance. ° .10 significance

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Related to Tables 7.1, 7.2, and 7.3—Findings of the multivariate statistical analysis of the influence of prose, document, and quantitative proficiencies on the probability of a labor force participant being unemployed at the time of the survey: 1992

Independent Variables	Prose		Document		Quantitative	
CONSTANT	.201***	(6.32)	.205***	(8.10)	.224***	(8.54)
AGE2	-.047***	(4.61)	-.047**	(4.59)	-.047***	(4.58)
AGE3	-.042***	(2.75)	-.043***	(3.81)	-.042***	(3.69)
AGE4	-.060***	(4.75)	-.061***	(4.84)	-.060***	(4.74)
AGE5	-.092***	(6.37)	.095***	(6.53)	.091	(6.35)
FEMALE	.005	(.83)	.004	(.65)	.002	(.31)
BLACK	.067**	(6.04)	.066***	(6.01)	.061***	(5.48)
HISP	.053***	(4.00)	.053***	(4.04)	.050***	(3.78)
ASIAN	.052**	(1.99)	.053**	(2.03)	.054**	(2.09)
OTHER	.056**	(2.25)	.055**	(2.24)	.052**	(2.12)
ENROLLED	-.008	(.74)	-.008	(.75)	-.008	(.77)
ED1	.082***	(4.71)	-.082***	(4.75)	.077**	(4.44)
ED2	.047***	(4.16)	.047**	(4.20)	.044***	(3.92)
ED3	.047***	(2.84)	-.047**	(2.82)	.046***	(2.81)
ED5	-.020**	(1.92)	.020**	(-1.97)	-.018**	(1.78)
ED6	-.014	(1.07)	-.014	(1.04)	-.012	(.90)
ED7	-.025**	(2.13)	-.026**	(2.29)	-.023**	(2.04)
ED8	-.040**	(3.16)	-.042***	(3.40)	-.039***	(3.14)
DISAB	.157***	(10.46)	.158***	(10.50)	.155***	(10.34)
REGION 2	-.013	(1.38)	-.014	(1.42)	.013	(1.37)
REGION 3	-.028***	(3.19)	-.029***	(3.23)	-.029***	(3.22)
REGION 4	-.005	(.54)	-.006	(.61)	-.006	(.59)
NONENG	-.098***	(4.49)	-.095***	(4.34)	-.095***	(4.26)
FOR5	-.025	(.98)	-.024	(.92)	-.023	(.91)
FOR6	-.025**	(1.71)	-.025*	(1.71)	-.025*	(1.72)
MARABS	.042	(1.60)	.044	(1.64)	.043	(1.63)
SEPDIV	.035***	(3.54)	.035***	(3.60)	.036***	(3.65)
SINGLE	.064***	(6.96)	.066***	(7.20)	.066***	(7.12)
PARTNER	.071***	(3.71)	.073***	(3.82)	.071***	(3.72)
PROFICIENCY	-.0004***	(4.68)	-.0003***	(4.04)	-.0004***	(4.68)
N	8747		8747		8747	
R^2		.075		.074		.075
F		23.56		23.224		23.56
SIG of F		.001		.001		.001

Notes: Age group = 16 to 65. Results are for both sexes combined. T-statistics are in parentheses. N = effective sample size. R^2 data are adjusted.

*** .01 significance ** .05 significance * .10 significance

Related to Tables 7.1, 7.2, and 7.3—Findings of the multivariate statistical analysis of the influence of prose, document, and quantitative proficiencies on the probability of an adult being employed at the time of the survey: 1992

Independent Variables	Prose	Document	Quantitative
CONSTANT	.491*** (12.48)	.489*** (15.21)	.482*** (13.85)
AGE2	.168*** (13.07)	.168*** (13.02)	.168*** (13.01)
AGE3	.173*** (12.28)	.174*** (12.39)	.171*** (12.20)
AGE4	.180*** (11.49)	.184*** (11.73)	.178*** (11.44)
AGE5	.035** (2.13)	.041 (2.43)	.038*** (1.97)
FEMALE	-.159*** (19.82)	-.156*** (19.52)	-.152*** (18.92)
BLACK	-.050*** (3.65)	-.048*** (3.52)	-.043*** (3.04)
HISP	-.041*** (2.52)	-.042*** (2.58)	-.039*** (2.36)
ASIAN	-.101*** (3.16)	-.103*** (3.24)	-.108*** (3.39)
OTHER	-.037 (1.199)	-.037 (1.20)	-.034 (1.10)
ENROLLED	-0.25** (1.86)	-.025** (1.83)	-.024** (1.75)
ED1	-.116*** (5.82)	-.115*** (5.88)	-.111*** (5.59)
ED2	-.053*** (3.81)	-.053*** (3.88)	-.050*** (3.66)
ED3	-.044** (2.14)	-.044** (2.12)	-.044** (2.12)
ED5	-.046*** (3.51)	.047*** (3.62)	-.045*** (3.45)
ED6	.022* (1.32)	.022* (1.30)	.021 (1.27)
ED7	.059*** (3.78)	.061*** (4.10)	.060*** (3.98)
ED8	.082*** (4.81)	.085*** (5.23)	.084*** (5.13)
DISAB	-.339*** (22.10)	-.339*** (22.31)	-.336** (1.75)
REGION 2	.021* (1.80)	.022** (1.86)	.022* (1.81)
REGION 3	.033*** (3.04)	.034*** (3.10)	.034*** (3.09)
REGION 4	.030** (2.38)	.032** (2.53)	.031** (2.50)
NONENG	.093*** (3.50)	.091*** (3.51)	.092*** (3.52)
FOR5	-.59** (1.98)	-.060** (2.02)	-.062** (2.10)
FOR6	.022 (1.18)	.020 (1.11)	.018 (.99)
MARABS	.004 (.14)	.004 (.11)	.005 (.16)
SEPDIV	.028** (2.24)	.028** (2.29)	.029** (2.35)
SINGLE	-.030*** (2.58)	-.032*** (2.74)	-.028** (2.39)
PARTNER	.010 (.39)	.006 (.24)	.010 (.39)
PROSE	.0007*** (5.45)	.0007*** (.708)	.0007*** (6.60)
N	11,120	11,120	11,120
R^2	.166	.166	.166
F	73.52	73.68	73.96
SIG of F	.001	.001	.001

Notes: Age group = 16 to 65. Results are for both sexes combined. T-statistics are in parentheses. N = effective sample size. R^2 data are adjusted.

*** .01 significance. ** .05 significance. * .10 significance.

Related to Tables 7.1, 7.2, and 7.3—Findings of the multivariate statistical analysis of the influence of prose, document, and quantitative proficiencies on the probability of an adult being employed full time at the time of the survey: 1992

Independent Variables	Prose		Document		Quantitative	
CONSTANT	.386***	(9.12)	.332***	(9.36)	.321***	(9.72)
AGE2	.233***	(16.98)	.233***	(16.96)	.233***	(16.95)
AGE3	.248***	(16.50)	.249***	(16.59)	.247***	(16.44)
AGE4	.260***	(15.55)	.263***	(15.79)	.259***	(15.57)
AGE5	.101***	(5.66)	.109***	(6.03)	.102***	(5.68)
FEMALE	-.229***	(26.72)	-.228***	(26.65)	-.223***	(26.12)
BLACK	-.000	(.03)	.008	(.56)	.014	(.93)
HISP	-.027	(1.55)	-.023	(1.34)	-.020	(1.13)
ASIAN	-.088***	(2.57)	-.085**	(2.51)	-.089***	(2.63)
OTHER	-.044	(1.34)	-.041	(1.24)	-.038	(1.15)
ENROLLED	-.123***	(8.54)	-.125***	(8.71)	-.124***	(8.67)
ED1	-.115***	(5.36)	-.103***	(4.91)	-.099***	(4.73)
ED2	-.047***	(3.14)	-.041***	(2.83)	-.039***	(2.62)
ED3	.008	(.34)	.008	(.39)	.009	(.39)
ED5	.043***	(3.05)	.039***	(2.85)	.036***	(2.72)
ED6	.042**	(2.28)	.035**	(1.99)	.035**	(1.95)
ED7	.109***	(6.57)	.102***	(6.41)	.100***	(6.35)
ED8	.122***	(6.74)	.114***	(6.56)	.112***	(6.58)
DISAB	-.359***	(21.97)	-.356***	(21.96)	-.353***	(21.68)
REGION 2	.005	(.40)	.005	(.38)	.004	(.33)
REGION 3	.032***	(2.66)	.032***	(2.70)	.032***	(2.70)
REGION 4	.017	(1.32)	.017	(1.33)	.017	(1.30)
NONENG	.072***	(2.54)	.082***	(2.97)	.084***	(3.06)
FOR5	-.020	(.64)	-.015	(.45)	-.016	(-.50)
FOR6	.012	(.60)	.015	(.76)	.013	(.67)
MARABS	.023	(.63)	.024	(.66)	.025	(.70)
SEPDIV	.041***	(3.10)	.043***	(3.23)	.044***	(3.29)
SINGLE	-.065***	(5.16)	-.065***	(5.22)	-.061***	(4.90)
PARTNER	.033	(1.24)	.031	(1.17)	.035	(1.30)
PROFICIENCY	.0004***	(3.20)	.0006***	(5.71)	.0006***	(5.71)
N	11,120		11,120		11,120	
R^2		.204		.206		.206
F		94.95		95.84		96.14
SIG of F		.001		.001		.001

Notes: Age group = 16 to 65. Results are for both sexes combined. T-statistics are in parentheses. N = effective sample size. R^2 data are adjusted.

*** .01 significance ** .05 significance * .10 significance

Related to Tables 7.1, 7.2, and 7.3—Findings of the multivariate statistical analysis of the influence of prose, document, and quantitative proficiencies on the probability of an adult being employed year-round, full time: 1992

Independent Variables	Prose		Document		Quantitative	
CONSTANT	.254***	(6.21)	.221***	(6.48)	.206***	(5.86)
AGE2	.231***	(16.67)	.230***	(16.64)	.230***	(16.63)
AGE3	.262***	(17.29)	.263***	(17.38)	.261***	(17.22)
AGE4	.284***	(16.87)	.285***	(17.10)	.283***	(16.86)
AGE5	.155***	(8.54)	.161***	(8.86)	.154***	(8.51)
FEMALE	-.214***	(24.74)	-.212***	(24.86)	-.207***	(24.04)
BLACK	.011	(.78)	.017	(1.20)	.024	(1.60)
HISP	-.017	(.99)	-.015	(.88)	-.011	(.65)
ASIAN	-.029	(.84)	-.028	(.83)	-.032	(.94)
OTHER	-.052	(1.55)	-.050	(1.49)	-.046	(1.39)
ENROLLED	-.103***	(7.08)	-.103***	(7.17)	-.103***	(7.13)
ED1	-.108***	(5.01)	-.100***	(4.76)	-.095***	(4.50)
ED2	-.067***	(4.47)	-.064***	(4.35)	-.060***	(4.08)
ED3	-.042**	(1.88)	-.041**	(1.84)	-0.41**	(1.84)
ED5	.048***	(3.42)	.047***	(3.34)	.045***	(3.17)
ED6	.016	(.85)	.012	(.67)	.011	(.61)
ED7	.087***	(5.25)	.084***	(5.23)	.082***	(5.08)
ED8	.043***	(2.37)	.039***	(2.15)	.037***	(2.13)
DISAB	-.294***	(17.84)	-.292***	(17.86)	-.288***	(17.54)
REGION 2	-.003	(.25)	-.003	(.25)	-.004	(.29)
REGION 3	.013	(1.11)	.014	(1.16)	.014	(1.15)
REGION 4	-.001	(.04)	.000	(.01)	-.000	(.02)
NONENG	.024	(.86)	.030	(1.07)	.032	(1.16)
FOR5	-.043	(1.34)	-.040	(1.25)	-.041*	(1.29)
FOR6	.015	(.77)	.016	(.83)	.014	(.75)
MARABS	.006	(.15)	.006	(.16)	.007	(.20)
SEPDIV	.023*	(1.70)	.024*	(1.79)	.025*	(1.86)
SINGLE	-.072***	(5.65)	-.073***	(5.74)	-.069***	(5.41)
PARTNER	-.012	(.45)	-.015	(.55)	-.011	(.42)
PROFICIENCY	.0005***	(4.11)	.0006***	(6.29)	.0007***	(6.51)
N	11,120		11,120		11,120	
R^2		.180		.181		.182
F		81.23		81.36		82.21
SIG of F		.001		.001		.001

Notes: Age group = 16 to 65. Results are for both sexes combined. T-statistics are in parentheses. N = effective sample size. R^2 data are adjusted.

*** .01 significance. ** .05 significance. * .10 significance.

Related to Tables 7.1, 7.2, and 7.3—Findings of the multivariate statistical analysis of the influence of prose, document, and quantitative proficiencies on the probability of an adult obtaining annual earnings above the four-person poverty line: 1992

Independent Variables	Prose	Document	Quantitative
CONSTANT	.169*** (4.39)	.131*** (3.76)	.131*** (3.50)
RAGE	.025** (19.67)	.025*** (19.83)	.024*** (19.56)
RAGESQ	-.0005*** (20.00)	-.0005*** (19.89)	-.0005*** (19.89)
FEMALE	-.233*** (27.70)	-.230*** (27.47)	-.224*** (26.76)
BLACK	.010 (.70)	.017 (1.18)	.023 (1.55)
HISP	-.008 (.47)	-.006 (.33)	-.002 (.15)
ASIAN	-.047 (1.41)	-.047 (1.41)	-.053 (1.58)
OTHER	-.056* (1.74)	-.054* (1.67)	-.051 (1.59)
ENROLLED	-.095*** (6.72)	-.096*** (6.77)	-.095*** (6.71)
ED1	-.079*** (3.76)	-.074*** (3.56)	-.068*** (3.22)
ED2	-.090*** (6.18)	-.088*** (6.10)	-.084*** (5.77)
ED3	-.057*** (2.62)	-.056*** (2.58)	-.056*** (2.57)
ED5	.064*** (4.72)	.063*** (4.67)	.062*** (4.52)
ED6	.057*** (3.21)	.054*** (3.05)	-.053*** (3.04)
ED7	.146*** (9.25)	.145*** (9.32)	.143*** (9.13)
ED8	.158*** (9.18)	.156*** (9.36)	.155*** (9.16)
DISAB	-.249*** (15.55)	-.248*** (15.59)	-.244*** (15.20)
REGION 2	-.023* (1.878)	-.024* (1.86)	-.024* (1.91)
REGION 3	-.013 (1.12)	-.012 (1.03)	-.012 (1.05)
REGION 4	.004 (.27)	.005 (.37)	.004 (.34)
NONENG	-.010 (.37)	-.004 (.16)	-.005 (.18)
FOR5	-.073*** (2.34)	-.070** (2.24)	-.073*** (2.35)
FOR6	.020 (1.05)	.021 (1.09)	.018 (.94)
MARABS	-.006 (.16)	-.005 (.16)	-.004 (.11)
SEPDIV	.017 (1.30)	.018 (1.40)	.019 (1.46)
SINGLE	-.081*** (6.39)	-.081*** (6.37)	-.078*** (6.14)
PARTNER	-.005 (.20)	-.008 (.31)	-.004 (.17)
PROFICIENCY	.0007*** (6.02)	.0008*** (8.21)	.0008*** (7.43)
N	11,120	11,120	11,120
R^2	.216	.218	.218
F	109.1	110.1	110.4
SIG of F	.001	.001	.001

Notes: Age group = 16 to 65. Results are for both sexes combined. T-statistics are in parentheses. N = effective sample size. R^2 data are adjusted.

*** .01 significance ** .05 significance * .10 significance

Related to Table 7.5—Findings of the multivariate statistical analysis of the influence of prose proficiencies on four labor force and employment status variables for adults: 1992

Independent variables	Civilian labor force participant		Unemployed (if in labor force)		Employed full time		Employed full time year round	
CONSTANT	.536***	(20.37)	.291***	(11.10)	.222***	(6.28)	.119***	(3.48)
AGE2	.163***	(14.26)	-.054***	(5.26)	.251***	(18.42)	.243***	(17.65)
AGE3	.175***	(14.09)	-.050***	(4.51)	.270***	(18.21)	.276***	(18.43)
AGE4	.165***	(11.97)	-.068***	(5.51)	.282***	(17.14)	.295***	(17.78)
AGE5	-.024	(1.61)	-.097***	(6.76)	.116***	(6.51)	.160***	(8.94)
FEMALE	-.175***	(24.26)	.006	(.85)	-.234***	(27.25)	-.216***	(24.98)
BLACK	-.000	(.03)	.063***	(5.72)	.007	(.46)	.017	(1.12)
HISP	-.005	(.36)	.054***	(4.13)	-.029	(1.64)	-.021	(1.21)
ASIAN	-.060**	(2.08)	.039	(1.51)	-.059*	(1.71)	-.008	(.24)
OTHER	.006	(.21)	.059**	(2.37)	-.049	(1.40)	-.057*	(1.71)
ENROLLED	-.031***	(2.62)	-.011	(1.06)	-.116***	(8.27)	-.100***	(7.09)
DISAB	-.304***	(22.20)	.164***	(10.90)	-.368***	(22.43)	-.304***	(18.41)
REGION2	.012	(1.12)	-.011	(1.14)	-.002	(.14)	-.007	(.55)
REGION3	.014	(1.42)	-.025***	(2.84)	.027**	(2.27)	.010	(.79)
REGION4	.032***	(2.85)	-.003	(.40)	.014	(1.07)	-.002	(.16)
NONENG	.016	(.68)	-.082***	(3.77)	.061**	(2.18)	.013	(.45)
FOR5	-.061**	(2.28)	-.041	(1.60)	.016	(.50)	-.015	(.47)
FOR6	.009	(.58)	-.030**	(2.06)	.023	(1.18)	.023	(1.19)
MARABS	.041	(1.37)	.046*	(1.72)	.020	(.54)	.000	(.00)
SEPDIV	.059***	(5.23)	.039***	(3.91)	.037***	(2.78)	.019	(1.42)
SINGLE	.031***	(2.92)	.062***	(6.64)	-.057***	(4.56)	-.064***	(5.08)
PARTNER	.080***	(2.92)	.074***	(3.88)	.030	(1.12)	-.017	(.64)
PROSE	.0008***	(10.62)	-.0006***	(7.50)	.001***	(9.60)	.001***	(9.63)
N	11,120		11,120		11,120		11,120	
R^2		.161		.068		.196		.174
F		92.70		27.37		117.48		101.33
SIG of F		.01		.01		.01		.01

Notes: Age group = 16 to 65. Results are for both sexes combined. T-statistics are in parentheses. N = effective sample size. R^2 data are adjusted.

*** .01 significance ** .05 significance * .10 significance

Related to Table 7.6—Findings of the multivariate statistical analysis of the influence of prose proficiencies on the weekly earnings of full-time employed adults, by sex and race/ethnicity (in actual dollars): 1992

Independent variables	Men	Women	White, not Hispanic	Black, not Hispanic	Hispanic
CONSTANT	-106 (1.24)	-116** (2.16)	-31 (.40)	179*** (2.76)	139 (1.08)
RAGE	24*** (8.60)	11*** (6.94)	17*** (8.28)	10*** (4.70)	23*** (4.58)
RAGESQ	-.33*** (6.07)	-.02*** (4.88)	-.22** (5.44)	-.16*** (3.84)	-.31*** (3.18)
FEMALE			-271***(20.37)	-98*** (6.56)	-126*** (3.78)
BLACK	-3 (.09)	55*** (3.10)			
HISP	-22 (.60)	37* (1.72)			
ASIAN	-119** (1.67)	49 (1.14)			
OTHER	-151** (2.10)	-1 (.02)			
ENROLLED	-106*** (3.37)	-65*** (3.73)	-95*** (4.16)	-10 (.40)	-97** (1.73)
ED1	-76** (1.65)	-21 (.76)	-8 (.19)	-26 (.73)	-169*** (2.76)
ED2	-57** (1.74)	-29* (1.62)	-18 (.73)	-41** (1.95)	-121** (2.32)
ED3	-31 (.64)	-36* (1.33)	-12 (.35)	-70** (1.73)	-100 (1.26)
ED5	41* (1.32)	44*** (2.61)	47** (2.20)	-3 (.14)	15 (.24)
ED6	44 (1.14)	56*** (2.50)	64*** (2.33)	25 (.77)	-36 (.47)
ED7	195** (5.68)	176*** (8.67)	190*** (7.66)	217*** (6.36)	195** (2.23)
ED8	527***(14.26)	304***(13.32)	431***(15.77)	343*** (8.11)	792*** (7.79)
DISAB	-58* (1.63)	-22 (1.09)	-44** (1.71)	-25 (-1.00)	-81 (1.26)
REGION2	-60** (2.18)	-55*** (3.43)	-62*** (3.24)	-41** (1.73)	-25 (.37)
REGION 3	-34 (1.33)	-28* (1.92)	-24 (1.34)	-89*** (4.71)	-13 (.27)
REGION4	-50* (1.77)	20 (1.19)	41** (1.98)	35 (1.20)	11 (.23)
NONENG	-75* (1.27)	26 (.74)	-48 (.54)	26 (.44)	-93* (1.60)
FOR5	39 (.58)	-25 (.64)	-62 (.71)	-62 (1.03)	-15 (.23)
FOR6	122*** (2.99)	11 (.47)	159*** (3.96)	-54 (1.44)	71* (1.68)
MARABS	-50 (.61)	65 (1.56)	25 (.36)	-34 (.83)	-74 (.68)
SEPDIV	-145*** (4.46)	51*** (3.43)	-50** (2.39)	-64*** (2.99)	-65 (1.24)
SINGLE	-100*** (3.62)	18 (1.12)	-100*** (4.86)	-81*** (3.82)	1 (.03)
PARTNER	-99* (1.79)	52 (1.54)	-18 (.42)	-87** (2.11)	-15 (.19)
PROSE	1.55*** (5.85)	1.06*** (6.27)	1.53*** (6.15)	1.02*** (4.75)	.51 (1.23)
N	5415	5688	8278	1272	1166
R2	.181	.121	.178	.265	.164
F	42.43	27.92	63.80	16.03	7.99
SIG of F	.001	.001	.001	.001	.001

Notes: Age group = 16 to 65. Racial/ethnic results are for both sexes combined. T-statistics are in parentheses. N = effective sample size. R^2 data are adjusted.

*** .01 significance ** .05 significance * .10 significance

Related to Tables 7.6, 7.9, and 7.12—Findings of the multivariate statistical analysis of the influence of prose, document, and quantitative proficiencies on the weekly earnings of full-time employed adults (in actual dollars): 1992

Independent Variables	Prose		Document		Quantitative	
CONSTANT	-17	(.21)	56	(.79)	-28	(.36)
RAGE	16***	(6.22)	17***	(6.43)	17***	(6.17)
RAGESQ	-.22**	(3.8)	-.22**	(3.93)	-.21***	(3.79)
FEMALE	-215***	(13.24)	-209***	(12.93)	-201***	(12.43)
BLACK	-6	(.23)	-14	(.48)	7	(.22)
HISP	-42	(1.24)	-50	(1.48)	-38	(1.12)
ASIAN	-99	(1.50)	-112*	(1.71)	-115*	(1.76)
OTHER	-124**	(1.83)	-132**	(1.96)	-124*	(1.81)
ENROLLED	-63**	(2.18)	-59**	(2.06)	-60**	(2.06)
ED1	-62	(1.30)	-78*	(1.66)	-55	(1.17)
ED2	-19	(.63)	-28	(.96)	-15	(.50)
ED3	8	(.06)	2	(.06)	3	(.07)
ED5	84***	(3.30)	92***	(3.67)	84***	(3.30)
ED6	102***	(3.11)	109***	(3.34)	100***	(3.05)
ED7	220***	(7.87)	238***	(8.76)	224***	(8.07)
ED8	470***	(15.41)	494***	(17.41)	477***	(16.21)
DISAB	-16***	(2.70)	-22	(.45)	-13	(.27)
REGION2	-65**	(2.19)	-62***	(2.58)	-64***	(2.68)
REGION 3	-49**	(1.98)	-46**	(2.10)	-46**	(2.10)
REGION4	48**	(1.98)	54**	(2.22)	53**	(2.17)
NONENG	-19	(.33)	-40	(.72)	-22	(.40)
FOR5	1	(.02)	-14	(.22)	-6	(.09)
FOR6	116***	(3.16)	105***	(2.87)	107***	(2.95)
MARABS	-6	(.10)	-10	(.15)	-7	(.10)
SEPDIV	-58**	(2.42)	-59**	(2.44)	-.56**	(2.31)
SINGLE	-85***	(3.61)	-88***	(3.77)	-82***	(3.50)
PARTNER	-25	(.52)	-35	(.74)	-28	(.59)
PROFICIENCY	1.37***	(5.43)	1.09***	(5.19)	1.37***	(5.72)
N	6015		6015		6015	
R2		.164		.162		.165
F		41.89		41.15		42.19
SIG of F		.001		.001		.001

Notes: Age group = 16 to 65. Results are for both sexes combined. T-statistics are in parentheses. N = effective sample size. R^2 data are adjusted.

*** 01 significance. ** 05 significance. * .10 significance

Related to Table 7.7—Findings of the multivariate statistical analysis of the influence of prose proficiencies on the weekly earnings of full-time employed adults, by sex and race/ethnicity (natural log of earnings): 1992

Independent variables	Men		Women		White, not Hispanic		Black, not Hispanic		Hispanic	
CONSTANT	5.14***	(70.24)	4.40***	(40.87)	5.06***	(62.18)	5.18***	(33.37)	5.56***	(40.49)
RAGE	.056***	(21.00)	.047***	(16.16)	.051***	(21.67)	.036***	(7.00)	.047***	(8.67)
RAGESQ	-.0009***	(16.77)	-.0008***	(13.08)	-.0008***	(16.97)	-.0006***	(6.21)	-.0007***	(7.02)
FEMALE	-.561***	(36.02)	-.228***	(6.34)	-.293***	(8.07)				
BLACK	.011	(.35)	.232***	(6.95)						
HISP	-.042	(1.18)	.168***	(4.13)						
ASIAN	-.117*	(1.73)	.135*	(1.69)						
OTHER	-.267***	(3.94)	.070	(.92)						
ENROLLED	-.171***	(5.75)	-.225***	(6.93)	-.198***	(7.42)	-.104**	(1.80)	-.252***	(4.14)
ED1	-.234***	(5.46)	-.168***	(3.26)	-.143***	(3.10)	-.061	(.70)	-.306***	(4.61)
ED2	-.238***	(7.78)	-.151***	(4.48)	-.171***	(5.92)	-.144***	(2.83)	-.257***	(4.53)
ED3	-.122***	(2.72)	-.022	(.44)	-.029	(.72)	-.128*	(1.32)	-.224***	(2.57)
ED5	.106***	(3.64)	.160***	(5.13)	.140***	95.64)	.025	(.41)	.150**	(2.22)
ED6	.140***	(3.90)	.206***	(4.86)	.203***	(6.25)	.106*	(1.35)	.051	(.61)
ED7	.371***	(11.55)	.541***	(14.26)	.463***	(16.31)	.484***	(5.84)	.418***	(4.38)
ED8	.582***	(17.02)	.744***	(17.22)	.659***	(21.32)	.690***	(6.77)	.830***	(7.52)
DISAB	-.158***	(95.64)	-.099***	(2.67)	-.154***	(5.14)	-.062	(1.03)	-.205***	(2.90)
REGION2	-.112***	(4.27)	-.146***	(4.91)	-.127***	(5.64)	-.081	(1.40)	-.180***	(2.42)
REGION3	-.110***	(4.54)	-.095***	(3.47)	-.081***	(3.77)	-.200***	(4.13)	-.179***	(3.28)
REGION4	-.003	(.12)	.018	(.59)	.003	(.16)	-.100	(1.53)	-.116**	(2.24)
NONENG	-.182***	(3.29)	-.022	(.32)	-.196**	(1.90)	-.044	(.32)	-.212***	(3.40)
FOR5	.003	(.05)	-.023	(.31)	-.113	(1.10)	-.032	(.22)	-.080	(1.13)
FOR6	.117***	(3.05)	.062	(1.38)	.206***	(4.40)	-.059	(.65)	.045	(.96)
MARABS	-.147*	(1.91)	.179**	(2.32)	.121	(1.50)	-.180*	(1.82)	-.226*	(1.92)
SEPDIV	-.259***	(8.43)	.114***	(4.10)	-.052**	(2.14)	-.202***	3.90)	-1.90***	(3.32)
SINGLE	-.346***	(13.32)	-.007	(.22)	-.256***	(10.55)	-.285***	(5.54)	-.277***	(5.35)
PARTNER	-.255***	(4.86)	.036	(.58)	-.125**	(2.39)	-.207**	(2.07)	-.114	(1.34)
PROSE	.0019***	(8.53)	.0021***	(6.23)	.0020***	(7.63)	.0025***	(4.86)	.0008**	(1.74)
N	5415		5688		8278		1272		1166	
R^2		.439		.250		.394		.298		.371
F	150.8		67.6		191.6		18.88		24.00	
SIG of F		.001		.001		.001		.001		.001

Notes: Age group = 16 to 65. Racial/ethnic results are for both sexes combined. T-statistics are in parentheses. N = effective sample size. R^2 data are adjusted.

*** .01 significance ** .05 significance * .10 significance

Related to Tables 7.7, 7.10, and 7.13—Findings of the multivariate statistical analysis of the influence of prose, document, and quantitative proficiencies on the weekly earnings of full-time employed adults (natural log of earnings): 1992

Independent Variables	Prose	Document	Quantitative
CONSTANT	5.273°°° (85.15)	5.336°°° (79.40)	5.248°°° (82.56)
RAGE	.033°°° (13.91)	.034°°° (14.28)	.033°°° (13.88)
RAGESQ	-.0005°°° (9.67)	-.0005°°° (9.82)	-.0005°°° (9.69)
FEMALE	-.356°°° (25.07)	-3.47°°° (24.59)	.335°°° (23.62)
BLACK	.003 (.13)	-.001 (.04)	.024 (.95)
HISP	-.053° (1.79)	-.062°° (2.08)	-.046 (1.56)
ASIAN	-.068 (1.18)	-.084 (1.46)	-.091 (1.58)
OTHER	-1.76°°° (2.97)	-.184°°° (3.11)	-.174°°° (2.90)
ENROLLED	-.061°°° (2.41)	-.057°° (2.25)	-.056°° (2.22)
ED1	-.231°°° (5.62)	-.245°°° (5.95)	-.220°°° (5.36)
ED2	-.140°°° (5.37)	-.149°°° (5.72)	-.133°°° (5.11)
ED3	-.089°°° (2.47)	-.088°°° (2.43)	-.088°°° (2.44)
ED5	.161°°° (7.31)	.170°°° (7.73)	.160°°° (7.25)
ED6	.206°°° (7.20)	.211°°° (7.36)	.202°°° (7.11)
ED7	.394°°° (16.36)	.414°°° (17.12)	.399°°° (16.68)
ED8	.576°°° (22.25)	.603°°° (23.75)	.585°°° (23.27)
DISAB	-.135°°° (3.14)	-.142°°° (3.29)	-.130°°° (3.03)
REGION2	-.144°°° (6.83)	-.140°°° (6.65)	-.143°°° (6.81)
REGION3	-.148°°° (7.67)	-.145°°° (7.48)	-.145°°° (7.47)
REGION4	-.008 (.39)	-.000 (.02)	-.002 (.08)
NONENG	-.043 (.89)	-.064° (1.34)	-.047 (.97)
FOR5	-.104°°° (1.83)	-.120°° (2.11)	-.113°° (1.99)
FOR6	.112°°° (3.52)	.100°°° (3.10)	.100°°° (3.16)
MARABS	-.011 (.20)	-.0.16 (.02)	-.012 (.20)
SEPDIV	-.105°°° (4.94)	-.104°°° (4.94)	-.100°°° (4.78)
SINGLE	-.185°°° (9.03)	-.189°°° (9.26)	-.180°°° (8.83)
PARTNER	-.095°° (2.27)	-.109°°° (2.63)	-.099°°° (2.40)
PROFICIENCY	.0020°°°(10.67)	.0018°°° (8.55)	.0020°°°(11.06)
N	6015	6015	6015
R^2	.394	.391	.396
F	138.9	137.4	140.4
SIG of F	.001	.001	.001

Notes: Age group = 16 to 65. Results are for both sexes combined. T-statistics are in parentheses. N = effective sample size. R^2 data are adjusted.

°°° .01 significance. °° .05 significance. ° .10 significance

Related to Tables 7.15 and 7.25—Findings of the multivariate statistical analysis of the influence of composite proficiencies on the weekly and annual earnings of full-time employed adults (natural log of earnings): 1992

Independent Variables	Weekly Earnings	Annual Earnings
CONSTANT	4.98*** (75.76)	8.09*** (93.67)
RAGE	.050*** (25.06)	.086*** (28.77)
RAGESQ	-.0008***(-19.60)	-.001*** (21.77)
FEMALE	-.478*** (36.38)	-.556*** (28.16)
BLACK	.162*** (7.08)	.131*** (3.87)
HISP	.083*** (3.11)	.068* (1.69)
ASIAN	-.004 (.07)	-.014 (.17)
OTHER	-.075 (1.48)	-.008 (.11)
ENROLLED	-.203*** (9.17)	-.241*** (7.19)
ED1	-.166*** (4.92)	-.324*** (6.49)
ED2	-.159*** (6.92)	-.238*** (6.96)
ED3	-.066* (1.94)	-.097* (1.90)
ED5	.112*** (5.21)	.189*** (5.88)
ED6	.162*** (5.82)	.181*** (4.34)
ED7	.440*** (17.61)	.546*** (14.80)
ED8	.659*** (24.39)	.693*** (17.36)
DISAB	-.141*** (5.61)	-.393*** (10.39)
REGION2	-.133*** (6.69)	-.166*** (5.51)
REGION3	-.115*** (6.26)	-.107*** (3.88)
REGION4	.000 (.02)	.041 (1.33)
NONENG	-.083** (1.92)	.061 (.94)
FOR5	-.006 (.11)	-.128** (1.73)
FOR6	.090*** (3.03)	.142*** (3.18)
MARABS	.012 (.22)	-.013 (.16)
SEPDIV	-.085*** (4.18)	-.083*** (2.72)
SINGLE	-.246*** (12.31)	-.314*** (10.43)
PARTNER	-.131*** (3.20)	-.077 (1.25)
COMPOSITE	.0023***(11.46)	.0028***(10.82)
N	11,120	11,120
R^2	.383	.343
F	246.52	207.19
SIG of F	.01	.01

Notes: Age group = 16 to 65. Results are for both sexes combined. T-statistics are in parentheses. N = effective sample size. R^2 data are adjusted.

***.01 significance. **.05 significance. *.10 significance

Related to Table 7.17—Findings of the multivariate statistical analysis of the influence of prose proficiencies on the annual earnings of employed adults, by sex and race/ethnicity (in actual dollars): 1992

Independent variables	Men		Women		White, not Hispanic		Black, not Hispanic		Hispanic	
CONSTANT	-3184	(1.23)	-7062***	(4.22)	-149	(.07)	3585	(1.24)	3555	(.99)
RAGE	1303***	(14.22)	768***	(15.44)	1063***	(15.94)	874***	(9.61)	821***	(5.95)
RAGESQ	-18.1***	(10.08)	-11.3***	(11.46)	-14.8***	(11.23)	-13.2***	(7.34)	-9.8***	(3.61)
FEMALE	-12,281***	(28.27)	-3537***	(5.45)	-6211***	(6.78)				
BLACK	-1079	(1.02)	2434***	(4.30)						
HISP	-1342	(1.10)	893	(1.29)						
ASIAN	-1198	(.51)	944	(.69)						
OTHER	-4679**	(2.00)	-14	(.01)						
ENROLLED	-5516***	(5.36)	-2322	(4.17)	-4092***	(5.49)	-412	(.39)	-3841***	(2.49)
ED1	-7689***	(5.17)	-2263	(2.59)	-4563***	(3.61)	-2498*	(1.57)	-6863***	(4.06)
ED2	-4236***	(4.01)	-1985	(3.48)	-2591***	(3.24)	-3451***	(3.75)	-3900***	(2.70)
ED3	-4286***	(2.76)	-2231	(2.60)	-2943***	(2.62)	-4247***	(2.42)	-3478*	(1.58)
ED5	2371**	(2.35)	1917	(3.60)	2298***	(3.34)	1676*	(1.53)	2234*	(1.30)
ED6	2606**	(2.10)	2281	(3.16)	3054***	(3.39)	1617	(1.14)	990	(.47)
ED7	10,991***	(9.94)	8261	(12.85)	10,516***	(13.57)	10,087***	(6.74)	4795**	(1.99)
ED8	26,099***	(22.06)	13,569	(18.65)	21,356***	(25.41)	15,050***	(8.14)	26,634***	(9.52)
DISAB	-5302***	(4.59)	-2428	(3.85)	-4602***	(5.49)	-3143***	(2.92)	-2318*	(1.30)
REGION2	-1721*	(1.89)	-2008	(3.95)	-1830***	(2.91)	-1772*	(1.70)	-2172	(1.15)
REGION3	-1212	(1.45)	-1247	(2.67)	-917	(1.53)	-2803***	(3.21)	-1830	(1.33)
REGION4	1152	(1.25)	639	(1.21)	927	(1.36)	2183*	(1.70)	-870	(.67)
NONENG	-979	(.51)	1349	(1.18)	617	(.21)	207	(.08)	-2046*	(1.28)
FOR5	-12	(.00)	-859	(.68)	-5468**	(1.91)	-1568	(.60)	1302	(.72)
FOR6	5068***	(3.81)	858	(1.12)	6014***	(4.60)	-908	(.55)	4059***	(3.47)
MARABS	-1919	(.72)	1469	(1.11)	1213	(.54)	-2298	(1.29)	-3049	(1.02)
SEPDIV	-5802***	(-5.47)	1319	(2.77)	-2578***	(3.81)	-2209**	(2.37)	-3414**	(2.36)
SINGLE	-6240***	(-6.96)	1155	(2.22)	-4946***	(7.33)	-3320***	(3.58)	-2876**	(2.21)
PARTNER	-5274***	(-2.91)	1206	(1.12)	-1356	(.93)	-4013**	(2.24)	-3439	(1.60)
PROSE	56**	(7.11)	43***	(8.18)	53***	(8.38)	36***	(3.72)	39***	(3.34)
N	5415		5688		8278		1272		1166	
R^2	.346		.246		.328		.335		.301	
F	101.72		65.82		144.06		22.39		17.53	
SIG of F	.001		.001		.001		.001		.001	

Notes: Age group = 16 to 65. Racial/ethnic results are for both sexes combined. T-statistics are in parentheses. N = effective sample size. R^2 data are adjusted.

*** .01 significance. ** .05 significance. * .10 significance

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Related to Tables 7.17, 7.19, and 7.21—Findings of the multivariate statistical analysis of the influence of prose, document, and quantitative proficiencies on the annual earnings of full-time employed adults (in actual dollars): 1992

Independent Variables	Prose		Document		Quantitative	
CONSTANT	264	(.16)	2288*	(1.34)	-186	(.12)
RAGE	1012***	(18.90)	1025***	(19.16)	1004***	(18.79)
RAGESQ	-13.8***	(13.09)	-13.9***	(13.10)	-13.7***	(13.04)
FEMALE	-10,591***	(29.62)	-10,359***	(29.16)	-10,028***	(28.23)
BLACK	1426**	(2.32)	1267**	(2.06)	1970***	(3.20)
HISP	191	(.26)	-33	(.05)	379	(.52)
ASIAN	13	(.00)	-332	(.23)	-527	(.37)
OTHER	-1512	(1.10)	-1660	(1.21)	-1320	(.96)
ENROLLED	-3889***	(6.49)	-3724***	(6.21)	-3770***	(6.30)
ED1	-5254***	(5.76)	-5765***	(6.44)	-4922***	(5.51)
ED2	-2714***	(4.40)	-3015***	(4.93)	-2533***	(4.12)
ED3	3344***	(3.65)	-3352***	(3.64)	-3311***	(4.12)
ED5	1894***	(3.26)	2147***	(3.70)	1860***	(3.23)
ED6	2428***	(3.23)	2649***	(3.52)	2390***	(3.21)
ED7	9728***	(14.52)	10,278***	(15.40)	9836***	(14.90)
ED8	21,197***	(28.76)	21,923***	(29.90)	21,423***	(30.20)
DISAB	-4066***	(6.01)	-4278***	(6.29)	-3869***	(5.69)
REGION2	-1963***	(3.64)	-1868***	(3.47)	-1946***	(3.62)
REGION 3	-1565***	(3.17)	-1500***	(3.03)	-1516***	(3.06)
REGION4	762	(1.37)	954*	(1.72)	875	(1.58)
NONENG	88	(.07)	-535	(1.46)	-31	(.03)
FOR5	-679	(.51)	-1022	(.77)	-940	(.71)
FOR6	3686***	(4.61)	3390***	(4.22)	3385***	(4.26)
MARABS	-248	(.17)	-376	(.25)	-209	(.14)
SEPDIV	-2631***	(4.77)	-2652***	(4.81)	-2541***	(4.62)
SINGLE	-4217***	(7.83)	-300***	(7.98)	-4071***	(7.55)
PARTNER	-2429**	(2.19)	-2688**	(2.43)	-2434**	(2.21)
PROFICIENCY	52***	(10.00)	44***	(8.42)	52***	(11.72)
N	11,120		11,120		11,120	
R^2		.326		.324		.327
F		191.7		189.7		193.1
SIG of F		.001		.001		.001

Notes: Age group = 16 to 65. Results are for both sexes combined. T-statistics are in parentheses. N = effective sample size. R^2 data are adjusted.

*** 01 significance ** 05 significance * 10 significance

Related to Table 7.18—Findings of the multivariate statistical analysis of the influence of prose proficiencies on the annual earnings of employed adults, by sex and race/ethnicity (natural log of earnings): 1992

Independent variables	Men	Women	White, not Hispanic	Black, not Hispanic	Hispanic
CONSTANT	8.377°°°(72.51)	7.422°°°(52.69)	8.276°°°(71.43)	7.876°°°(30.10)	8.427°°°(37.36)
RAGE	.089°°°(22.65)	.084°°°(18.83)	.086°°°(24.58)	.100°°°(11.82)	.074°°° (7.84)
RAGESQ	-.0014°°°(17.99)	-.001°°°(14.10)	-.001°°°(18.87)	-.0015°°°(8.96)	-.001°°° (5.70)
FEMALE	-.631°°°(27.64)	-1.56°°° (2.57)	-.560°°° (8.95)		
BLACK	-.079°° (1.74)	.219°°° (4.37)			
HISP	.013 (.26)	.060 (.97)			
ASIAN	-.043 (.44)	.060 (.49)			
OTHER	-.082 (.82)	-.027 (.24)			
ENROLLED	-.320°°° (7.24)	-.164°°° (3.29)	-.239°°° (6.11)	-.136 (1.39)	-.196°° (1.87)
ED1	-.435°°° (6.80)	-.282°°° (3.63)	-.311°°° (4.64)	-.143 (.98)	-.416°°° (3.66)
ED2	-.279°°° (6.17)	-.270°°° (5.31)	-.232°°° (5.49)	.365°°° (4.26)	-.193°° (1.98)
ED3	-.147°° (2.22)	-.059 (.77)	-.070 (1.18)	-.267° (1.62)	-.095 (.63)
ED5	.143°°° (3.32)	.267°°° (5.60)	.197°°° (5.45)	.286°°° (2.80)	.357°°° (3.07)
ED6	.118°° (2.22)	.275°°° (4.25)	.198°°° (4.18)	.296°° (2.23)	.267°° (1.85)
ED7	.505°°°(10.59)	.606°°°(10.56)	.570°°°(13.01)	.680°°° (4.86)	.528°°° (3.22)
ED8	.633°°°(12.41)	.752°°°(11.68)	.715°°°(15.98)	.690°°° (4.00)	.808°°° (4.27)
DISAB	-.385°°° (7.79)	-.403°°° (7.11)	-.418°°° (9.49)	-.493°°° (4.90)	-.253°° (2.07)
REGION2	-.138°°° (3.55)	-.190°°° (4.18)	-.159°°° (4.81)	-.147 (1.51)	-.119 (.93)
REGION3	-.089°° (2.50)	-.100°° (2.38)	-.089°°° (2.84)	-.102 (1.25)	-.150 (1.59)
REGION4	-.032 (.81)	-.040 (.85)	-.033 (.91)	.155 (1.29)	-.169° (1.89)
NONENG	.005 (.06)	.954 (.53)	.070 (.46)	.059 (.25)	-.031 (.29)
FOR5	-.098 (1.04)	-.137 (1.21)	-.393°°° (2.62)	.256 (1.05)	-.018 (.15)
FOR6	.157°°° (2.76)	.095 (1.38)	.133 (1.93)	.081 (.53)	.231°°° (2.91)
MARABS	-.221° (1.94)	.180 (1.51)	.148 (1.26)	-.448°°° (2.66)	-.040 (.20)
SEPDIV	-.302°°° (6.67)	.138°°° (3.24)	-.073°° (2.04)	-.198°° (2.27)	-.173° (1.75)
SINGLE	-.555°°°(14.46)	.059 (1.27)	-.328°°° (9.26)	-.315°°°93.63)	-.373°°° (4.20)
PARTNER	-.244°°° (3.15)	.142 (1.47)	-.002 (.02)	-.215 (1.28)	-.242° (1.65)
PROSE	.0022°°°(6.33)	.0025°°°(5.64)	.0022°°°(5.99)	.0025°°°(2.3)	.0022°°°(3.12)
N	5415	5688	8278	1272	1166
R^2	.430	.217	.350	.321	297
F	144.9	56.1	158.8	21.0	17.24
SIG of F	.001	.001	.001	.001	.001

Notes. Age group = 16 to 65. Racial/ethnic results are for both sexes combined. T-statistics are in parentheses. N = effective sample size. R^2 data are adjusted.

°°° .01 significance. °° .05 significance. ° .10 significance

Related to Tables 7.18, 7.20, and 7.22—Findings of the multivariate statistical analysis of the influence of prose, document, and quantitative proficiencies on the annual earnings of employed adults (natural log of earnings): 1992

Independent Variables	Prose		Document		Quantitative	
CONSTANT	8.23***	(82.72)	8.22***	(93.52)	8.17***	(98.05)
RAGE	.086***	(28.69)	.086***	(28.94)	.085***	(28.61)
RAGESQ	-.001***	(21.83)	-.001***	(21.78)	-.001***	(21.80)
FEMALE	-.569***	(28.55)	-.560***	(28.22)	-.543***	(27.37)
BLACK	.103***	(2.97)	.109***	(3.24)	.133***	(3.90)
HISP	.054	(1.34)	.052	(1.31)	.066	(1.64)
ASIAN	-.011	(.14)	-.020	(.25)	-.034	(.43)
OTHER	-.020	(.26)	-.020	(.25)	-.08	(.11)
ENROLLED	.238***	(7.10)	-.234***	(7.02)	-.234***	(7.01)
ED1	-.353***	(6.89)	-.357***	(7.18)	-.331***	(6.63)
ED2	-.252***	(7.28)	-.256***	(7.51)	-.240***	(7.01)
ED3	-.100**	(1.95)	-.099**	(1.93)	-.098**	(1.91)
ED5	.198***	(6.09)	.202***	(6.28)	.193***	(6.02)
ED6	.194***	(4.60)	.194***	(4.65)	.189***	(4.54)
ED7	.560***	(14.82)	.571***	(15.44)	.560***	(15.24)
ED8	.709***	(17.10)	.723***	(18.07)	.713***	(18.05)
DISAB	-.403***	(10.64)	-.407***	(10.76)	-.391***	(10.30)
REGION2	-.164***	(5.46)	-.162***	(5.38)	-.164***	(5.47)
REGION 3	-.109***	(3.94)	-.106***	(3.83)	-.107***	(3.86)
REGION4	-.042	(1.35)	-.055	(1.15)	-.038	(1.22)
NONENG	.036	(.54)	.030	(.47)	.039	(.60)
FOR5	-.139**	(1.88)	-.142**	(1.92)	-.147**	(2.00)
FOR6	.139***	(3.10)	.133***	(2.98)	.127***	(2.87)
MARABS	-.017	(.21)	-.020	(.24)	-.014	(.17)
SEPDIV	-.088***	(2.87)	-.087***	(2.82)	-.083***	(2.71)
SINGLE	-.318***	(10.59)	-.320***	(10.64)	-.311***	(10.31)
PARTNER	-.076	(1.24)	-.087	(1.41)	-.076	(1.23)
PROFICIENCY	.0025***	(7.36)	.0023***	(8.34)	.0025***	(10.23)
N	11,120		11,120		11,120	
R^2		.342		.342		.342
F	205.5		205.5		207.1	
SIG of F		.001		.001		.001

Notes: Age group = 16 to 65. Results are for both sexes combined. T-statistics are in parentheses. N = effective sample size. R^2 data are adjusted.

*** .01 significance ** .05 significance * .10 significance

Related to Table 7.27—Findings of the multivariate statistical analysis of the influence of quantitative proficiencies and the intensity of their use on the job on the weekly and annual earnings of employed adults (natural log of earnings): 1992

Independent Variables	Weekly Earnings	Annual Earnings
CONSTANT	5.00*** (116.78)	8.54*** (123.23)
RAGE	.030*** (18.51)	.030*** (12.42)
RAGESQ	-.0004***(12.41)	-.0004*** (7.81)
FEMALE	-.331*** (32.64)	-.529*** (32.79)
BLACK	.059*** (3.23)	.125*** (4.25)
HISP	-.00 (.23)	-.005 (.16)
ASIAN	-.044 (1.16)	-.036 (.58)
OTHER	-.145*** (3.01)	-.221*** (3.00)
ENROLLED	-.092*** (5.22)	-.734*** (30.73)
ED1	-.140*** (4.70)	-.200*** (4.20)
ED2	-.085*** (4.46)	-.121*** (4.04)
ED3	-.063** (2.39)	.014 (.32)
ED5	.162*** (10.02)	.337*** (13.08)
ED6	.208*** (9.92)	.393*** (11.93)
ED7	.404*** (23.15)	.608*** (20.76)
ED8	.582*** (31.73)	.816*** (24.64)
DISAB	-.118*** (3.81)	-.461*** (11.36)
REGION1	.148*** (10.62)	.113*** (4.99)
REGION3	-.001 (.04)	-.050*** (2.33)
REGION4	.131*** (9.56)	.071*** (3.22)
NONENG	-.061** (1.72)	.054 (.92)
FOR5	-.110*** (2.71)	-.115** (1.80)
FOR6	.071*** (3.18)	.146*** (4.00)
MARABS	-.018 (.44)	-.014 (.21)
SEPDIV	-.093 (6.17)	-.024 (.97)
SINGLE	-.176*** (12.22)	-.471*** (20.57)
PARTNER	-.088*** (2.98)	-.143*** (2.87)
QUANT	.0016*** (9.99)	-.0003 (.13)
Q*MATHINT	.00018***(10.03)	.0006***(23.68)
N	11,382	16.622
R^2	.403	.354
F	266.18	314.69
SIG of F	.001	.001

Notes: Age group = 16 to 65. Results are for both sexes combined. T-statistics are in parentheses. N = effective sample size. R^2 data are adjusted.

*** .01 significance. ** .05 significance. * .10 significance.

Related to Table 7.28—Findings of the multivariate statistical analysis of the influence of prose, document, and quantitative proficiencies on the probability of an adult being a member of a poor/near poor family: 1992

Independent Variables	Prose		Document		Quantitative	
CONSTANT	.182***	(5.73)	.199***	(6.18)	.197***	(6.98)
AGE2	.016	(1.39)	.016	(1.42)	.016	(1.43)
AGE3	-.035***	(2.87)	-.036***	(2.94)	-.034***	(2.83)
AGE4	-.091***	(6.77)	-.094***	(6.91)	-.091***	(6.75)
AGE5	-.100***	(6.91)	-.103***	(7.06)	-.099***	(6.85)
FEMALE	.028***	(4.10)	.027***	(3.93)	.025***	(3.57)
BLACK	.047***	(4.03)	.046***	(3.84)	.042***	(3.57)
HISP	.090***	(6.42)	.090***	(6.42)	.088***	(6.27)
ASIAN	.065***	(3.84)	.066***	(2.38)	.068***	(2.46)
OTHER	.102***	(10.09)	.102***	(3.83)	.100***	(3.75)
ENROLLED	.013	(1.10)	.013	(1.12)	.013	(1.08)
ED1	.174***	(10.09)	.172***	(9.96)	.169***	(9.93)
ED2	.102***	(8.52)	.101***	(8.47)	.100***	(8.37)
ED3	.076***	(4.26)	.076***	(4.24)	.075***	(4.24)
ED5	-.018*	(1.57)	-.018*	(1.56)	-.016	(1.46)
ED6	-.006	(.42)	.005	(.36)	-.004	(.33)
ED7	-.051***	(3.88)	-.051***	(3.89)	-.050***	(3.86)
ED8	-.057***	(3.93)	-.057***	(3.98)	-.056***	(3.97)
DISAB	.122***	(9.25)	.122***	(9.27)	.120***	(9.09)
REGION 2	.042***	(3.95)	.041***	(3.94)	.041***	(3.96)
REGION 3	.046***	(4.81)	.046***	(4.77)	.046***	(4.78)
REGION 4	.044***	(4.12)	.044***	(4.06)	.044***	(4.09)
NONENG	.016	(.69)	.015	(.64)	.014	(.61)
FOR5	-.041	(1.61)	-.042	(1.64)	-.041	(1.61)
FOR6	-.014	(.91)	-.014	(.90)	-.013	(.84)
MARABS	.068**	(2.35)	.068**	(2.36)	.067***	(2.33)
SEPDIV	.112***	(10.44)	.111***	(10.39)	.111***	(10.35)
SINGLE	.025***	(2.52)	.026***	(2.60)	.024***	(2.38)
PARTNER	.068***	(3.15)	.069***	(3.23)	.067**	(3.14)
PROFICIENCY	-.0003***	(3.25)	-.0004***	(3.69)	-.0004***	(4.38)
N	11,120		11,120		11,120	
R^2		.103		.103		.104
F		42.48		42.64		42.77
SIG of F		.001		.001		.001

Notes: Age group = 16 to 65. Results are for both sexes combined. T-statistics are in parentheses. N = effective sample size. R^2 data are adjusted.

*** .01 significance ** .05 significance * .10 significance

Related to Table 7.28—Findings of the multivariate statistical analysis of the influence of prose, document, and quantitative proficiencies on the probability of an adult being a recipient of cash public assistance income: 1992

Independent Variables	Prose		Document		Quantitative	
CONSTANT	.204***	(6.83)	.199***	(7.44)	.213***	(8.99)
AGE2	-.019**	(1.96)	.020**	(2.01)	.020**	(2.01)
AGE3	-.018*	(1.63)	.019**	(1.72)	-.017*	(1.56)
AGE4	-.064***	(5.33)	-.066***	(5.53)	-.063***	(5.27)
AGE5	-.078***	(6.08)	-.082***	(6.30)	-.076***	(5.94)
FEMALE	.057***	(9.33)	.055***	(9.02)	.052***	(8.47)
BLACK	.146***	(13.90)	.146***	(13.88)	.141***	(13.39)
HISP	.087***	(7.00)	.088***	(7.11)	.085***	(6.86)
ASIAN	.050**	(2.04)	.052**	(2.13)	.055***	(2.25)
OTHER	.157***	(6.63)	.157***	(6.66)	.154***	(6.53)
ENROLLED	-.011	(1.10)	-.012	(1.17)	-.012	(1.20)
ED1	.108***	(7.11)	.109***	(7.19)	.104***	(6.98)
ED2	.120***	(11.30)	.121***	(11.44)	.118***	(11.24)
ED3	.078***	(4.92)	.077***	(4.89)	.077***	(4.90)
ED5	-.031***	(3.11)	-.032***	(3.24)	-.030***	(3.07)
ED6	-.039***	(2.98)	-.039***	(3.02)	-.038***	(2.95)
ED7	-.052***	(4.33)	-.054***	(4.69)	-.052***	(4.59)
ED8	-.035***	(2.72)	-.039***	(3.09)	-.037***	(2.99)
DISAB	.168***	(14.33)	.169***	(14.49)	.166***	(14.22)
REGION 2	.000	(.51)	-.000	(.15)	.000	(.04)
REGION 3	-.020**	(2.40)	-.0[illegible]	(2.47)	-.021**	(2.46)
REGION 4	-.009	(.97)	[illegible]	(1.13)	-.010	(1.08)
NONENG	-.026	(1.30)	-.024	(1.19)	-.026	(1.33)
FOR5	-.094***	(4.10)	-.093***	(4.06)	-.092***	(4.05)
FOR6	-.060***	(4.29)	-.058***	(4.20)	-.057***	(4.15)
MARABS	.121***	(4.74)	.122***	(4.78)	.121***	(4.72)
SEPDIV	.103***	(10.88)	.103***	(10.86)	.102***	(10.80)
SINGLE	.043***	(4.82)	.045***	(4.99)	.042***	(4.63)
PARTNER	.128***	(6.69)	.131***	(6.87)	.128***	(6.73)
PROFICIENCY	-.0005***	(5.19)	-.0005***	(5.69)	-.0005***	(7.38)
N	11,120		11,120		11,120	
R^2		.158		.157		.158
F		69.18		69.14		69.61
SIG of F		.001		.001		.001

Notes: Age group = 16 to 65. Results are for both sexes combined. T-statistics are in parentheses. N = effective sample size. R^2 data are adjusted.

*** .01 significance. ** .05 significance. * .10 significance

Related to Table 7.28—Findings of the multivariate statistical analysis of the influence of prose, document, and quantitative proficiencies on the probability of an adult being disabled (includes prison inmates): 1992

Independent Variables	Prose		Document		Quantitative	
CONSTANT	.208***	(9.62)	.187***	(8.54)	.220***	(10.11)
AGE2	.010	(1.24)	.010*	(1.33)	.011*	(1.33)
AGE3	.048***	(5.45)	.046***	(5.27)	.048***	(5.52)
AGE4	.069***	(7.14)	.067***	(6.84)	.071***	(7.25)
AGE5	.122***	(11.69)	.119***	(11.31)	.125***	(11.96)
FEMALE	.004	(.77)	.001	(.17)	-.004	(.79)
BLACK	-.013	(1.58)	-.018	(1.47)	-.022**	(2.53)
HISP	-.035***	(3.47)	-.033***	(3.21)	-.038***	(3.74)
ASIAN	-.022	(1.13)	-.018	(.93)	-.016	(.77)
OTHER	-.017	(.90)	-.016	(.81)	-.020	(1.06)
ENROLLED	-.005	(.56)	-.006	(.74)	-.006	(.73)
ED1	.121***	(9.92)	.125***	(10.16)	.115***	(9.27)
ED2	.047***	(5.46)	.050***	(5.86)	.043***	(5.05)
ED3	.041***	(3.21)	.041***	(3.19)	.040***	(3.14)
ED5	.014*	(1.75)	.011	(1.41)	.015*	(1.86)
ED6	.017	(1.63)	.015	(1.44)	.018	(1.72)
ED7	.008	(.80)	.002	(.17)	.007	(.73)
ED8	.006	(.62)	-.001	(.13)	.004	(.42)
REGION 2	.011	(1.43)	.010	(1.29)	.011	(1.42)
REGION 3	.012*	(1.82)	.012*	(1.72)	.012*	(1.72)
REGION 4	.021***	(2.72)	.019**	(2.42)	.020**	(2.53)
NONENG	-.059***	(3.63)	-.052***	(3.23)	-.058***	(3.63)
FOR5	-.004***	(3.24)	-.057***	(3.06)	.057***	(3.09)
FOR6	-.058***	(5.11)	-.054***	(4.82)	-.053***	(4.80)
MARABS	.050**	(2.48)	.052***	(2.57)	.049**	(2.42)
SEPDIV	.049***	(6.29)	.049***	(6.31)	.047***	(6.12)
SINGLE	.034***	(4.62)	.036***	(4.94)	.031***	(4.26)
PARTNER	.012	(.80)	.017	(1.08)	.013	(.81)
PROFICIENCY	-.0007***	(10.85)	-.0006***	(9.48)	-.0007***	(11.34)
N	11,172		11,172		11,172	
R^2		.080		.078		.083
F		33.37		32.52		34.73
SIG of F		.001		.001		.001

Notes: Age group = 16 to 65. Results are for both sexes combined. T-statistics are in parentheses. N = effective sample size. R^2 data are adjusted.

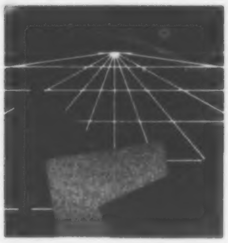
*** .01 significance. ** .05 significance. * .10 significance.

Related to Table 7.29—Findings of the multivariate statistical analysis of the influence of quantitative proficiencies on the poor/near poor, cash public assistance, and disability status of adults: 1992

Independent Variables	Poor/ Near Poor	Cash Public Assistance Recipient	Disabled
CONSTANT	.358*** (14.45)	.358*** (16.94)	.287*** (15.44)
AGE2	.007 (.64)	.011 (1.15)	.012 (1.49)
AGE3	-.045*** (3.79)	-.029*** (2.76)	.051*** (5.92)
AGE4	-.101*** (7.56)	-.074*** (6.23)	.074*** (7.75)
AGE5	-.099*** (6.86)	-.080*** (6.26)	.134*** (12.97)
FEMALE	.022*** (3.14)	.050*** (8.07)	-.006 (1.24)
BLACK	.033*** (2.72)	.134*** (12.66)	-.026*** (3.05)
HISP	.094*** (6.62)	.091*** (7.20)	-.035*** (3.41)
ASIAN	.051* (1.80)	.043* (1.79)	-.022 (1.11)
OTHER	.105*** (3.91)	.161*** (6.72)	-.020 (1.04)
ENROLLED	.013 (1.13)	-.020* (1.95)	.000 (.05)
DISAB	.135*** (10.14)	.177*** (15.04)	—
REGION2	.045*** (4.32)	.003 (.31)	.011 (1.56)
REGION3	.050*** (5.23)	-.018** (2.12)	.015** (2.14)
REGION4	.045*** (4.17)	-.011 (1.19)	.021*** (2.70)
NONENG	.041** (1.85)	-.018 (.92)	-.034** (2.15)
FOR5	-.071*** (2.76)	-.117*** (5.13)	-.068*** (3.71)
FOR6	-.017 (1.11)	-.065*** (4.71)	-.052*** (4.64)
MARABS	.075*** (2.58)	.129*** (4.98)	.054*** (2.62)
SEPDIV	.115*** (10.68)	.106*** (11.08)	.049*** (6.35)
SINGLE	.012 (1.22)	.031*** (3.38)	.027*** (3.61)
PARTNER	.075*** (3.48)	.135*** (7.06)	.017 (1.06)
QUANT	-.0009***(12.43)	-.001*** (16.40)	-.0009***(17.34)
N	11,120	11,120	11,172
R^2	.089	.141	.075
F	46.58	79.10	40.83
SIG of F	.01	.01	.01

Notes: Age group = 16 to 65. Results are for both sexes combined. T-statistics are in parentheses. N = effective sample size. R^2 data are adjusted.

*** .01 significance. ** .05 significance. * .10 significance



CHAPTER EIGHT

Summary of Findings and Implications

The preceding chapters have described and assessed the major findings of the National Adult Literacy Survey with respect to the proficiencies of the nation's entire civilian labor force and of particular subpopulations of interest — including the employed and the unemployed, demographic and socioeconomic subgroups of the employed, and those working in major industries and occupations. Relationships between the literacy proficiencies of the employed and their weekly and annual earnings also were examined. This final chapter summarizes and considers the implications of these findings.

Overall, this analysis of the literacy skills of the nation's civilian labor force reveals a mixed picture, one that contains both encouraging and discouraging elements. On the positive side, the mean prose, document, and quantitative proficiencies of adults in the labor force were found to be consistently and significantly higher than those of adults who were neither working nor looking for work at the time of the NALS assessment. In fact, the average scores of labor force participants were 40 to 43 points, or .6 to .7 standard deviations, higher than those of adults who were not active in the labor force.

On the negative side, however, is the finding that a substantial share of the nation's labor force had limited literacy proficiencies. Between 40 and 43 percent of the labor force participants performed in the two lowest levels of proficiency defined in this survey. Further, only one of four attained the two highest literacy levels defined. In fact, on each literacy scale, only 3 to 5 percent of the adults active in the labor force scored in the highest level.

Less than 10 percent of the nation's labor force possessed literacy proficiencies that were high enough to allow them to perform the following types of tasks consistently (that is, at least 80 percent of the time):

- Interpret or compare views expressed in newspaper editorials, newspaper articles, or government documents
- Construct bar graphs with given data, or summarize the findings of data presented in tabular format

- Calculate the total costs of a catalog order, estimate the costs of carpeting a room of given size, or estimate the interest payments owed on a car loan over the course of the repayment period

The survey data also suggest that we are not a nation of readers who can readily synthesize information, master multi-step quantitative tasks, or analyze graphics. The types of critical reasoning skills believed to be in growing demand in the work places of the future are not evident among many members of the current labor force.

While adults not active in the labor force had below-average scores on each of the three literacy scales, those who were younger than age 65 performed far better than their older counterparts.[1] For example, approximately one-third of those age 16 to 65 who were neither working nor looking for work at the time of the assessment had proficiencies equal to or greater than the average for all labor force participants, and 29 percent had composite scores equal to or above those of the full-time employed.[2] Given that 38 million persons age 16 to 65 were not participating in the labor force in 1993, the above two groups comprise a substantial "labor force reserve" with average to above average proficiencies.[3] There were nearly 13 million adults who were younger than age 65, and who were not in the labor force, with average or better literacy proficiencies. This group should be viewed by national policymakers as a valuable source of labor to meet the nation's future human resource requirements.

Literacy Proficiencies of the Employed and Unemployed

On two of the three literacy scales, adults employed full time significantly outperformed those employed part time. The absolute sizes of these differences were quite small, however, ranging from 4 to 10 points across the scales. The differences between the mean scores of full-time and part-time employees were attributable to men rather than to women. There were no statistically significant differences between the mean scores of women who worked full time and those who worked part time.

The average literacy scores of unemployed individuals were 28 to 35 points, or .5 to .6 standard deviations, below those of the full-time employed. The differences in mean scores between these two groups were quite substantial. The unemployed were substantially overrepresented in the lowest two levels on each literacy scale (60 percent), while only 10 to 11 percent performed in the two highest levels. In contrast, 27 to 29 percent of the full-time employed scored in Levels 4 and 5. Unemployment rates among civilian labor force participants were strongly and negatively associated with their proficiency levels, especially on the quantitative scale. In general, unemployment rates among labor force participants in Level 1 were four to seven times higher than those of participants in Level 5.

The mean literacy scores of the unemployed varied by age group. While workers age 45 and older were characterized by the lowest unemployment rates, unemployed individuals in this age group had the lowest mean scores on each of the scales. National data from U.S. Bureau of Labor Statistics surveys of dislocated workers suggest that many of the older unemployed have been dislocated from their previous jobs, and that those with limited formal schooling and proficiencies tend to experience more severe problems in becoming re-employed. Strengthening the literacy proficiencies of dislocated workers, particularly older workers, is one strategy that could improve the employment and earnings prospects of such workers and prevent them from withdrawing from active labor force participation. Proposed re-employment initiatives that provide systematic linkages between public and private literacy programs and re-employment programs for dislocated workers appear to be especially promising.

Literacy Proficiencies of the Full-time Employed

Mean literacy proficiencies varied across key demographic and socioeconomic subgroups of the nation's full-time employed. The mean scores of full-time employed men and women were quite similar on each of the three scales, with women faring slightly better than men on the prose scale (7 points) and males performing slightly better than women on the quantitative scale (4 points). These findings suggest that female labor force participants are not an educationally disadvantaged group.

The mean scores of the full-time employed rise from the youngest age group to the 35 to 44 age group, then decline as age increases. The lowest scores were possessed by workers in their pre-retirement years (age 55 to 64) and older adults (age 65 and older). The mean proficiencies of full-time workers in the latter two age groups were nearly .8 to .9 standard deviations below those of 35- to 44-year-olds. These findings indicate that newer entrants into the full-time labor force will have stronger average proficiencies than those who will be retiring over the next decade, thereby raising the average proficiency of the native labor force.

On each literacy scale, mean proficiencies were highest for White workers followed by Asian, Black, and Hispanic workers. The mean scores of White full-time employees exceeded those of their Black and Hispanic counterparts by between .8 and .9 standard deviations on each scale. Hispanics of Mexican origin performed most poorly due in large part to the generally weak English literacy proficiencies and formal school attainments of recent migrants to this country.

Foreign-born full-time employees who had lived in the United States for 10 years or less had mean proficiency scores at or below 200 on each literacy scale. These scores were 83 to 90 points below those of native-born full-time workers. High percentages of the immigrant labor force who had come to this country within the past decade did not perform even the most rudimentary literacy tasks successfully. For example, one-fourth were not consistently able to perform such tasks as signing their name on a Social Security card; 30 percent were unable to perform tasks such as locating the expiration date on a driver's license, and nearly 40 percent did not consistently succeed on tasks such as adding two entries on a bank deposit slip. The limited English literacy proficiencies demonstrated by many recent immigrants raise important issues for the nation's current immigration policies. There is a potential conflict between the national goal of boosting the literacy proficiencies of the future work force and existing immigration policies which have led to a surge of immigrants with very limited English literacy skills.

The mean literacy scores of the full-time employed rose continuously and substantially with the years of formal schooling that they had completed by the time of the survey. The mean proficiencies of high-school graduates (or GED holders) exceeded those of high-school dropouts by .6 standard deviations, and the mean scores of four-year college graduates were a full standard deviation above those of high-school graduates. The rising annual earnings differentials between college and high-school graduates appear to reflect, in part, a rising economic payoff to literacy proficiencies. College-educated workers do not only possess substantially higher average literacy skills, but they also enjoy higher economic payoffs from stronger skills. The future economic outlook for the nation suggests that those who earn a college diploma and who acquire a strong base of literacy proficiencies will enjoy the greatest earnings advantages. For example, in a recent report on the future retirement outlook for the baby-boom generation, the Congressional Budget Office noted that: "Although the future looks bright for those who are well-educated, it is distinctly gloomy for those without many marketable skills. Those with a college education can expect higher incomes, faster wage growth, and more resources available for saving."[4]

Literacy Proficiencies by Industry and Occupation

An analysis of the mean prose, document, and quantitative scores of the employed by major industrial group revealed considerable variability across sectors, largely reflecting differences in the educational and occupational compositions of their internal work forces. The highest mean proficiencies were posted by workers in the finance, insurance, and real estate industries and the public administration sector. Workers in goods-producing industries (agriculture, construction, manufacturing, mining) were the poorest performers. Their mean scores were at least half a standard deviation below those for workers in the finance, insurance, and real estate industries.

Within the goods-producing industries, many front-line, blue-collar workers displayed quite limited literacy proficiencies. Sixty percent performed in Level 1 or 2 on the prose and document scales, while only one of ten performed in Level 4 or 5 on these two scales. The nation's goods-producing industries are critical to the export performance of the United States economy. During 1992, approximately 70 percent of the value of the nation's exports involved goods produced by the agriculture, mining, and manufacturing industries, and many domestic firms in manufacturing are subject to growing international competition.[5] While the skills of the work force are only one factor influencing the economic competitiveness of a nation, further investments in the literacy skills of our front-line workers may help to improve our future productivity and competitiveness. Competing on the basis of higher productivity rather than lower wages or a further devalued dollar will surely redound to the economic advantage of the nation's front-line workers and consumers.

Looking across the occupational groups, mean literacy proficiencies were highest for professional workers followed by managers, administrators, and technical workers. Mean scores were lowest for semi-skilled and unskilled blue collar workers and for farm, forestry, and fishing workers. The absolute sizes of the gaps between the mean scores of professionals and those of semi-skilled and unskilled blue-collar workers were quite substantial (approximately 80 points on each scale). The existence of such large literacy gaps across occupations threatens the nation's ability to increase substantively the number of high-performance work organizations over the remainder of this decade. Marshall and Tucker have argued that adoption of such types of work organizations in all sectors of the economy would require "the vast majority of our high school graduates (to) take on tasks now assigned only to managers and professionals in our workplaces."[6] Successful performance of such tasks will be dependent upon a substantial improvement in the literacy proficiencies of current front-line workers and a substantive increase in the economic rewards to front-line workers for possessing such proficiencies.[7]

On average, the projected fastest growing occupations in this country have literacy requirements considerably above the mean for all current workers. At the margin, literacy requirements clearly will be rising. A comparative analysis of the actual 1990 and projected 2005 national occupational employment structures predicted only moderate increases in literacy requirements, on average, given the actual 1992 literacy proficiencies of workers within each occupational group. The mean literacy scores of all jobs projected to exist in the year 2005 were only 2 to 3 points above those prevailing in 1992. Unless the demand for professional, managerial, and technical workers increases at a rate faster than that projected by the U.S. Bureau of Labor Statistics, or unless literacy requirements for existing jobs are substantially upgraded, there does not appear to be any serious literacy mismatch between the projected occupational job structure and the available work force in the early years of the 21st century. To enhance the economic returns to future literacy skills of our nation's work force, it may be necessary to simultaneously raise the proficiencies of workers and upgrade jobs in the economy. The research findings in this report indicated that individuals who apply their literacy skills intensively in the workplace do, on average, have higher earnings than those who do not.

Literacy Proficiencies and Earnings

The literacy proficiencies of the employed are positively and consistently associated with their weekly and annual earnings, although the strength of these associations varies across demographic and occupational subgroups. On each literacy scale, the mean weekly earnings of the full-time employed rise consistently and strongly across the literacy levels. On the prose scale, mean weekly earnings ranged from $355 for full-time workers in Level 1 to $531 for those in Level 3 to a high of $910 for those in Level 5, the highest proficiency level. These strong relationships between literacy skills and weekly earnings prevail for most demographic and socioeconomic subgroups of the employed (gender, race/ethnicity, age, educational attainment, and geographic region), but they were considerably weaker for younger workers (under 25 years of age) and for high-school dropouts. Young workers are highly concentrated in jobs that require little formal schooling and skills; thus, higher economic payoffs from higher literacy proficiencies require their being sorted into career jobs as they reach their mid-twenties.

Estimated earnings functions revealed that literacy proficiencies consistently had a statistically significant, positive independent effect on the expected weekly earnings of the full-time employed. A one standard deviation increase in workers' prose or quantitative proficiencies would be expected to increase their weekly earnings directly by 12 percent. The estimated relative size of the effects of higher proficiencies on weekly earnings were quite similar for men and women and for Whites and Blacks, but they tended to vary more widely across age, educational attainment, and occupational subgroups. In many cases, there were no statistically significant effects of higher proficiencies on the weekly earnings of the youngest full-time workers (age 16 to 24), while for workers in the 45 to 54 and the 55 to 64 age groups, the direct earnings effects were quite substantial (15 to 16 percent). The weekly earnings impacts of higher scores were smallest for workers who had completed some high school (9-12 years, no diploma) and highest for those with a two- or four-year degree (17 percent). By major occupational group, the effects of a one standard deviation increase in literacy proficiencies on weekly earnings ranged from lows of 6 percent for workers in service and semi-skilled and unskilled blue collar occupations to highs of 14 to 16 percent for professional and managerial workers.

When both the direct and indirect effects of higher literacy proficiencies on weekly earnings were taken into account, the relative size of the estimated earnings impacts was doubled. Higher literacy proficiencies were also associated with higher earnings through workers' formal educational attainments. Persons with higher literacy scores were considerably more likely to graduate from high school, attend college, and obtain a four-year college degree.

The annual earnings of the employed also were strongly associated with their proficiencies on each of the three scales. The mean annual earnings of persons who were employed at some time in the year before the assessment was slightly less than $21,000. On the quantitative scale, mean annual earnings ranged from a low of $12,020 for workers in Level 1 to $20,620 for those in Level 3 to $39,190 for those in Level 5. The age/earnings profiles of workers are also much more steeply sloped for those in the higher proficiency levels. The absolute and relative sizes of the annual earnings differentials between the more and less proficient rise sharply as workers progress through their work lives, partly reflecting their greater access to training and education both on and off the job as they gain more experience. For example, comparing the annual earnings of workers in Level 3 with those in Level 1, the relative earnings ratio rises from 1.10 for those in the 16 to 24 age group to 1.78 in the 45 to 54 age group. Previous national research has revealed that workers with more formal schooling and stronger literacy proficiencies are more likely to be employed in firms that offer training, and they are more likely to be selected by their employers to participate in such training. Workers with limited skills will acquire less additional human capital as they move through their working lives, thereby increasing the size of the human capital gaps and earnings potential between the most and least proficient. Policymakers concerned with rising earnings inequality in the work force could develop strategies to increase the access of less literate workers to training and education opportunities both on and off the job.

The findings from the earnings function analyses revealed that a one standard deviation increase in prose, document, or quantitative proficiencies would be expected to increase annual earnings directly by 14 to 15 percent. A similar increase in workers' composite proficiency (prose, document and quantitative together) would yield an increase in expected annual earnings of nearly 17 percent. Taking into account both the direct and indirect effects of higher proficiencies on annual earnings, a one standard deviation increase in literacy proficiencies would raise expected annual earnings by 30 to 31 percent. The earnings effects of higher prose and quantitative scores are significantly associated with the intensity with which workers use their reading, writing, and math skills on the job. Employees who apply such skills daily at work had sharply higher economic returns than those who do not. Raising the productivity and earnings potential of the future work force will require simultaneous increases in both the demand and supply of literacy proficiencies.

Literacy Proficiencies of the Poor or Near Poor and of Public Assistance Recipients

Renewed growth in the nation's poverty and public assistance populations in the early 1990s has led to a search for more effective anti-poverty policies and for ways to restructure the nation's welfare system, especially the former Aid to Families with Dependent Children program (AFDC). The literacy proficiencies of poor or near poor individuals (those living in households with a combined money income below 125 percent of the poverty line) were well below average on each of the scales. The median prose and quantitative scores of the poor or near poor were at or slightly below the 30th percentile of the distribution for all civilians, excluding prison inmates. However, poor or near poor persons who were attached to the labor force had considerably higher proficiencies than those neither working nor looking for work. Literacy deficits seem to be an important barrier to the employability of poor or near poor individuals who are not active in the labor force. Only 30 percent of poor or near poor adults who were not participating in the labor market were identified as having literacy proficiencies strong enough to achieve moderate or higher earnings potential (weekly earnings of $250 or higher from full-time employment).

The literacy proficiencies of persons whose families receive AFDC benefits were also well below the average for the entire civilian population. The median composite score for all AFDC recipients was only 739, equivalent to the 30th percentile.[8] The median score for AFDC recipients who were not working at the time of the survey had a percentile ranking of 24th. Only one of every ten non-employed AFDC recipients had a composite score equal to or greater than the median score for workers who were earning $250 or more per week.[9] The vast majority of the non-employed AFDC population appears to be in need of substantive literacy training to boost their earnings potential sufficiently to make them independent of welfare. Several educational initiatives for AFDC recipients in California have proven capable of significantly increasing the numbers of participants who earn GED certificates and high-school diplomas and boosting their achievement test scores.[10] To succeed in raising the long-term earnings of participants, such educational programs must be closely integrated with job placement, job search training, and job training programs.

Participation in Basic Skills Training Programs

Although many adults in the nation's civilian labor force displayed limited literacy skills, only one of every 10 labor force participants between the ages of 25 and 64 reported having ever received basic skills training outside of the regular school system. Less than 5 percent of the labor force members said they had participated in such a program in the past five years. Labor force participants with lower proficiencies were more likely than those with higher proficiencies to have received basic skills training in the past five years. Yet, the differences in the percentages of individuals who had received such training did not vary substantially across the literacy levels. For example, only 6 percent of labor force participants in Level 1 had received basic skills training in the past five years, compared with 4 percent of those in Level 3 and nearly 3 percent of those in Level 5.

Among those who said they had received some basic skills training since leaving school, only four of 10 indicated that the training was provided by an employer or a labor union. Workers in the lowest level of prose and quantitative literacy were actually somewhat less likely than their more proficient counterparts to obtain basic skills training from their employers

Overall, the evidence from this survey indicates major deficits in basic skills training for the less literate members of the work force, particularly at the worksite. These findings are in close accord with those of other recent surveys on workplace literacy programs. One researcher recently estimated that only 1 to 3 percent of the small businesses in this country currently sponsor any workplace literacy program despite the fact that a substantial fraction of their employees (25 to 40 percent) are believed to have basic skill deficits that limit their work performance and productivity.[11]

There seems to be a major need for expanded literacy training of United States workers, especially those with the most limited skills. The National Adult Literacy Survey data indicate that nearly all subgroups of employees, including front-line workers, receive positive economic payoffs from higher literacy proficiencies, and a recent study suggests that participation in workplace literacy programs has a positive impact on wages.[12] A joint labor-management-government partnership to improve the quantity and quality of literacy training for the work force may be vitally important to the future success of efforts to boost labor productivity and increase the real wages of the nation's front-line workers.

Endnotes

1. Nearly five of every six older adults (age 65 and older) were neither working nor looking for work at the time of the survey. National research based on the Current Population Surveys reveals that few older adults who are not in the labor force wish to work. In 1992, for example, only 2 percent of the 32.9 million adults age 60 and older who were not in the labor force expressed a desire for an immediate job. See: U.S. Bureau of Labor Statistics, *Employment and Earnings*, January 1993, p. 214.

2. A composite literacy score was calculated for each individual, based on the sum of his or her prose, document, and quantitative scores. The mean composite score of civilian labor force participants younger than age 65 was used to represent the "average" literacy proficiency for this group.

3. See: U.S. Bureau of Labor Statistics, *Employment and Earnings*, January 1994, "Table 3," p. 184, U.S. Government Printing Office, Washington, D.C., 1994.

4. See: "U.S. Study, Counter to Fears, Says Some Boomers to Fare Well," *The Boston Globe*, September 19, 1993, p. 21.

5. See: U.S. Council of Economic Advisers, *Economic Report of the President, 1994*, U.S. Government Printing Office, Washington, D.C., 1994.

6. See: Ray Marshall and Marc Tucker, *Thinking for a Living: Education and the Wealth of Nations*, Basic Books, New York, 1992, p. 79.

7. An analysis of the findings for the estimated earnings functions for full-time workers (discussed in Chapter Seven) revealed that the economic return to higher literacy proficiencies for semi-skilled and unskilled blue-collar workers was less than half that for professional and managerial workers. One would expect that workers' willingness to invest in strengthening their literacy skills would be influenced by the expected return from such investments.

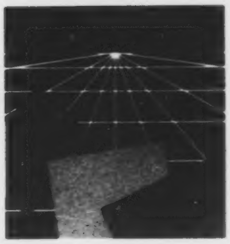
8. For the civilian population younger than age 65, the median composite literacy score was 859. The median score of AFDC recipients was 120 points, or two-thirds of a standard deviation, lower.

9. The median composite score for full-time workers earning $250 or more per week was 905, or 166 points higher than the median score for AFDC recipients. This difference is equivalent to nearly one full standard deviation.

10. For a review of the impacts of educational initiatives for AFDC recipients in several California counties under the GAIN program, see: Karin Martinson and Daniel Friedlander, *GAIN: Basic Education in a Welfare-to-Work Program*, Manpower Demonstration Research Corporation, New York, 1994.

11. Kevin Hollenbeck, *Classrooms in the Workplace*, W.E. Upjohn Institute for Employment Research, Kalamazoo, Michigan, 1993.

12. Hollenbeck estimates an 11 to 17 percent return in the form of higher wages to participants in workplace literacy programs. See: Kevin Hollenbeck, "The Economic Payoffs to Workplace Literacy," Staff Working Paper 93-21, W.E. Upjohn Institute for Employment Research, Kalamazoo, 1993.



APPENDIX A

Interpreting the Literacy Scales

Building on the two earlier literacy surveys conducted by Educational Testing Service (ETS), the performance results from the National Adult Literacy Survey are reported on three literacy scales — prose, document, and quantitative — rather than on a single conglomerate scale. Each of the three literacy scales ranges from 0 to 500.

The purpose of this section of the report is to give meaning to the literacy scales — or, more specifically, to interpret the numerical scores that are used to represent adults' proficiencies on these scales. Toward this end, the section begins with a brief summary of the task development process and of the way in which the literacy levels are defined. A detailed description of the prose, document, and quantitative scales is then provided. The five levels on each scale are defined, and the skills and strategies needed to successfully perform the tasks in each level are discussed. Sample tasks are presented to illustrate the types of materials and task demands that characterize the levels on each scale. The section ends with a brief summary of the probabilities of successful performance on tasks within each level for individuals who demonstrated different proficiencies.

Building the Literacy Tasks

The literacy scales make it possible not only to summarize the literacy proficiencies of the total population and of various subpopulations, but also to determine the relative difficulty of the literacy tasks administered in the survey. That is, just as an individual receives a score according to his or her performance on the assessment tasks, each task receives a value according to its difficulty as determined by the performance of the adults who participated in the survey. Previous research conducted at ETS has shown that the difficulty of a literacy task, and therefore its placement on a particular literacy scale, is determined by three factors: the structure or linguistic format of the material, the content and/or the context from which it is selected, and the nature of the task, or what the individual is asked to do with the material.

Materials. The materials selected for inclusion in NALS reflect a variety of linguistic formats that adults encounter in their daily activities. Most of the prose materials used in the survey are expository — that is, they describe, define, or inform — since most of the prose that adults read is expository in nature; however, narratives and poetry are included, as well. The prose materials include an array of linguistic structures, ranging from texts that are highly organized both topically and visually to those that are loosely organized. They also include texts of varying lengths, from multiple-page magazine selections to short newspaper articles. All prose materials included in the survey were reproduced in their original format.

The document materials represent a wide variety of structures, which are characterized as tables, charts and graphs, forms, and maps, among other categories. Tables include matrix documents in which information is arrayed in rows and columns — for example, bus or airplane schedules, lists, or tables of numbers. Documents categorized as charts and graphs include pie charts, bar graphs, and line graphs. Forms are documents that require information to be filled in, while other structures include such materials as advertisements and coupons.

The quantitative tasks require the reader to perform arithmetic operations using numbers that are embedded in print. Since there are no materials that are unique to quantitative tasks, these tasks were based on prose materials and documents. Most quantitative tasks were, in fact, based on document structures.

Content and/or Contexts. Adults do not read printed or written materials in a vacuum. Rather, they read within a particular context or for a particular purpose. Accordingly, the NALS materials represent a variety of contexts and contents. Six such areas were identified: home and family; health and safety; community and citizenship; consumer economics; work; and leisure and recreation.

In selecting materials to represent these areas, efforts were made to include as broad a range as possible, as well as to select universally relevant contexts and contents. This was to ensure that the materials would not be so specialized as to be familiar only to certain groups. In this way, disadvantages for individuals with limited background knowledge were minimized.

Types of Tasks. After the materials were selected, tasks were developed to accompany the materials. These tasks were designed to simulate the ways in which people use various types of materials and to require different strategies for successful task completion. For both the prose and document scales, the tasks can be organized into three major categories: ***locating, integrating,*** and ***generating*** information. In the locating tasks, readers are asked to match information that is given in a question or directive with either literal or synonymous information in the text or document. Integrating tasks require the reader to incorporate two or more pieces of information located in different parts of the text or document. Generating tasks require readers not only to process information located in different parts of the material, but also to go beyond that information by drawing on their knowledge about a subject or by making broad text-based inferences.

Quantitative tasks require readers to perform arithmetic operations — addition, subtraction, multiplication, or division — either singly or in combination. In some tasks, the type of operation that must be performed is obvious from the wording of the question, while in other tasks the readers must infer which operation is to be performed. Similarly, the numbers that are required to perform the operation can, in some cases, be easily identified, while in others, the numbers that are needed are embedded in text. Moreover, some quantitative tasks require the reader to explain how the problem would be solved rather than perform the calculation, and on some tasks the use of a simple four-function calculator is required.

Defining the Literacy Levels

The relative difficulty of the assessment tasks reflects the interactions among the various task characteristics described here. As shown in Figure 1 in the Introduction to this report, the score point assigned to each task is the point at which the individuals with that proficiency score have a high probability of responding correctly. In this survey, an 80 percent probability of correct response was the criterion used. While some tasks were at the very low end of the scale and some at the very high end, most had difficulty values in the 200 to 400 range.

By assigning scale values to both the individuals and tasks, it is possible to see how well adults with varying proficiencies performed on tasks of varying difficulty. While individuals with low proficiency tend to perform well on tasks with difficulty values equivalent to or below their level of proficiency, they are less likely to succeed on tasks with higher difficulty values. This does not mean that individuals with low proficiency can never succeed on more difficult literacy tasks — that is, on tasks whose difficulty values are higher than their proficiencies. They may do so some of the time. Rather, it means that their probability of success is not as high. In other words, the more difficult the task relative to their proficiency, the lower their likelihood of responding correctly.

The response probabilities for two tasks on the prose scale are displayed in Figure A.1. The difficulty of the first task is measured at the 250 point on the scale, and the second task is at the 350 point. This means that an individual would have to score at the 250 point on the prose scale to have an 80 percent chance (that is, a .8 probability) of responding correctly to Task 1. Adults scoring at the 200 point on the prose scale have only a 40 percent chance of responding correctly to this task, whereas those scoring at the 300 point and above would be expected to rarely miss this task and others like it.

In contrast, an individual would need to score at the 350 point to have an 80 percent chance of responding correctly to Task 2. While individuals performing at the 250 point would have an 80 percent chance of success on the first task, their probability of answering the more difficult second task correctly is only 20 percent. An individual scoring at the 300 point is likely to succeed on this more difficult task only half the time.

An analogy may help clarify the information presented for the two prose tasks. The relationship between task difficulty and individual proficiency is much like the high jump event in track and field, in which an athlete tries to jump over a bar that is placed at increasing heights. Each high jumper has a height at which he or she is proficient. That is, he or she is able to clear the bar at that height with a high probability of success, and can clear the bar at lower levels almost every time. When the bar is higher than their level of proficiency,

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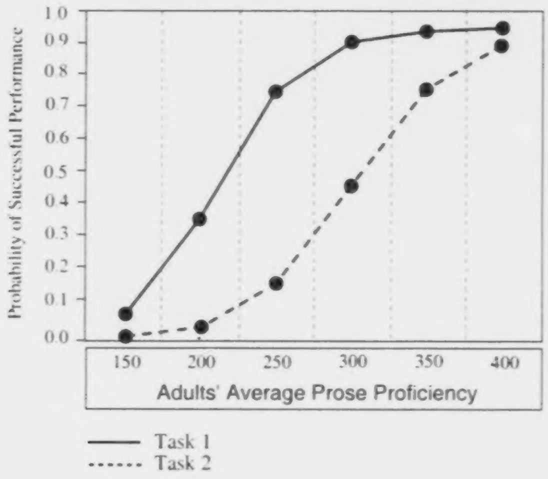
Figure A.1

Probabilities of Successful Performance on Two Prose Tasks by Individuals at Selected Points on the Prose Scale



Source: U.S. Department of Education, National Center for Education Statistics, National Adult Literacy Survey, 1992.

however, they can be expected to have a much lower chance of clearing it successfully.

Once the literacy tasks are placed on their respective scales, using the criterion described here, it is possible to see how well the interactions among the task characteristics explain the placement of various tasks along the scales.[1] In investigating the progression of task characteristics across the scales, certain questions are of interest. Do tasks with similar difficulty values (that is, with difficulty values near one another on a scale) have certain shared characteristics? Do these characteristics differ in systematic ways from tasks in either higher or lower levels of difficulty? Analyses of the interactions between the materials read and the tasks based on these materials reveal that an ordered set of information-processing skills appears to be called into play to perform the range of tasks along each scale.

To capture this ordering, each scale was divided into five levels that reflect the progression of information-processing skills and strategies: Level 1 (0 to 225), Level 2 (226 to 275), Level 3 (276 to 325), Level 4 (326 to 375), and Level 5 (376 to 500). These levels were determined not as a result of any statistical property of the scales, but rather as a result of shifts in the skills and strategies required to succeed on various tasks along the scales, from simple to complex.

The remaining pages of this section describe each scale in terms of the nature of the task demands at each of the five levels. After a brief introduction to each scale, sample tasks in each level are presented and the factors contributing to their difficulty are discussed. The aim of these discussions is to give meaning to the scales and to facilitate interpretation of the results provided in the first and second sections of this report.

Interpreting the Literacy Levels

Prose literacy

The ability to understand and use information contained in various kinds of textual material is an important aspect of literacy. Most of the prose materials administered in this assessment were expository — that is, they inform, define, or describe — since these constitute much of the prose that adults read. Some narrative texts and poems were included, as well. The prose materials were drawn from newspapers, magazines, books, brochures, and pamphlets and reprinted in their entirety, using the typography and layout of the original source. As a result, the materials vary widely in length, density of information, and the use of structural or organizational aids such as section or paragraph headings, italic or bold face type, and bullets.

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[1] I.S. Kirsch and P.B. Mosenthal. (1990). "Exploring Document Literacy: Variables Underlying the Performance of Young Adults." **Reading Research Quarterly**, 25, pp. 5-30.

Each prose selection was accompanied by one or more questions or directives which asked the reader to perform specific tasks. These tasks represent three major aspects of information-processing: locating, integrating, and generating. Locating tasks require the reader to find information in the text based on conditions or features specified in the question or directive. The match may be literal or synonymous, or the reader may need to make a text-based inference in order to perform the task successfully. Integrating tasks ask the reader to compare or contrast two or more pieces of information from the text. In some cases the information can be found in a single paragraph, while in others it appears in different paragraphs or sections. In the generating tasks, readers must produce a written response by making text-based inferences or drawing on their own background knowledge.

In all, the prose literacy scale includes 41 tasks with difficulty values ranging from 149 to 468. It is important to remember that the locating, generating, and integrating tasks extend over a range of difficulty as a result of interactions with other variables including:

- the number of categories or features of information that the reader must process
- the number of categories or features of information in the text that can distract the reader, or that may seem plausible but are incorrect
- the degree to which information given in the question is obviously related to the information contained in the text
- the length and density of the text

The five levels of prose literacy are defined, and sample tasks provided, in the following pages.

Prose Level 1 Scale range: 0 to 225

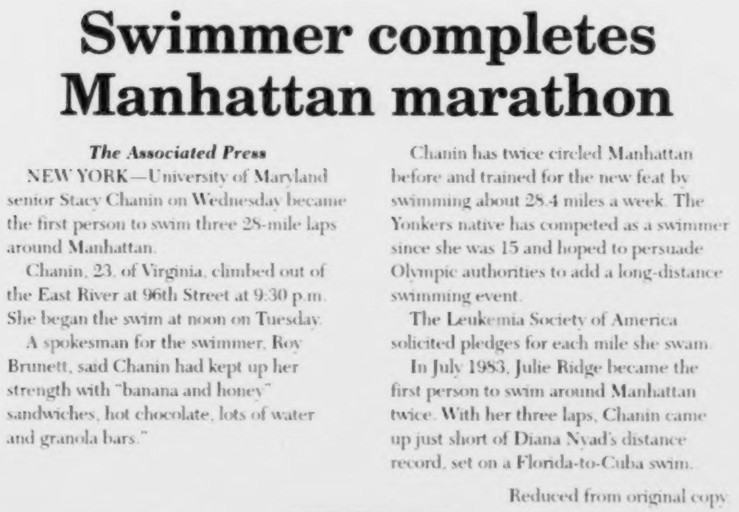
Most of the tasks in this level require the reader to read relatively short text to locate a single piece of information which is identical to or synonymous with the information given in the question or directive. If plausible but incorrect information is present in the text, it tends not to be located near the correct information.

Average difficulty value of tasks in this level: 198
Percentage of labor force performing in this level: 14%

Tasks in this level require the reader to locate and match a single piece of information in the text. Typically the match between the question or directive and the text is literal, although sometimes synonymous matches may be necessary. The text is usually brief or has organizational aids such as paragraph headings or italics that suggest where in the text the reader should search for the specified information. The word or phrase to be matched appears only once in the text.

One task in Level 1 with a difficulty value of 210 asks respondents to read a newspaper article about a marathon swimmer and to underline the sentence that tells what she ate during a swim. Only one reference to food is contained in the passage, and it does not use the word "ate." Rather, the article says the swimmer "kept up her strength with banana and honey sandwiches, hot chocolate, lots of water and granola bars." The reader must match the word "ate" in the directive with the only reference to foods in the article.

Underline the sentence that tells what Ms. Chanin ate during the swim.



Swimmer completes Manhattan marathon

The Associated Press

NEW YORK—University of Maryland senior Stacy Chanin on Wednesday became the first person to swim three 28-mile laps around Manhattan.

Chanin, 23, of Virginia, climbed out of the East River at 96th Street at 9:30 p.m. She began the swim at noon on Tuesday.

A spokesman for the swimmer, Roy Brunett, said Chanin had kept up her strength with "banana and honey" sandwiches, hot chocolate, lots of water and granola bars."

Chanin has twice circled Manhattan before and trained for the new feat by swimming about 28.4 miles a week. The Yonkers native has competed as a swimmer since she was 15 and hoped to persuade Olympic authorities to add a long-distance swimming event.

The Leukemia Society of America solicited pledges for each mile she swam.

In July 1983, Julie Ridge became the first person to swim around Manhattan twice. With her three laps, Chanin came up just short of Diana Nyad's distance record, set on a Florida-to-Cuba swim.

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Prose Level 2 Scale range: 226 to 275

Some tasks in this level require readers to locate a single piece of information in the text; however, several distractors or plausible but incorrect pieces of information may be present, or low-level inferences may be required. Other tasks require the reader to integrate two or more pieces of information or to compare and contrast easily identifiable information based on a criterion provided in the question or directive.

Average difficulty value of tasks in this level: 259
Percentage of labor force performing in this level: 25%

Like the tasks in Level 1, most of the tasks in this level ask the reader to locate information. However, these tasks place more varied demands on the reader. For example, they frequently require readers to match more than a single piece of information in the text and to discount information that only partially satisfies the question. If plausible but incomplete information is included in the text, such distractors do not appear near the sentence or paragraph that contains the correct answer. For example, a task based on the sports article reproduced earlier asks the reader to identify the age at which the marathon swimmer began to swim competitively. The article first provides the swimmer's current age of 23, which is a plausible but incorrect answer. The correct information, age 15, is found toward the end of the article.

In addition to directing the reader to locate more than a single piece of information in the text, low-level inferences based on the text may be required to respond correctly. Other tasks in Level 2 (226 to 275) require the reader to identify information that matches a given criterion. For example, in one task with a difficulty value of 275, readers were asked to identify specifically what was wrong with an appliance by choosing the most appropriate of four statements describing its malfunction.

A manufacturing company provides its customers with the following instructions for returning appliances for service:

> When returning appliance for servicing, include a note telling as clearly and as specifically as possible what is wrong with the appliance.

A repair person for the company receives four appliances with the following notes attached. Circle the letter next to the note which best follows the instructions supplied by the company.

A The clock does not run correctly on this clock radio. I tried fixing it, but I couldn't.

C The alarm on my clock radio doesn't go off at the time I set. It rings 15-30 minutes later.

B My clock radio is not working. It stopped working right after I used it for five days.

D This radio is broken. Please repair and return by United Parcel Service to the address on my slip.

Readers in this level may also be asked to infer a recurring theme. One task with a difficulty value of 262 asks respondents to read a poem that uses several metaphors to represent a single, familiar concept and to identify its theme. The repetitiveness and familiarity of the allusions appear to make this "generating" task relatively easy.

Prose Level 3 Scale range: 276 to 325

Tasks in this level tend to require readers to make literal or synonymous matches between the text and information given in the task, or to make matches that require low-level inferences. Other tasks ask readers to integrate information from dense or lengthy text that contains no organizational aids such as headings. Readers may also be asked to generate a response based on information that can be easily identified in the text. Distracting information is present, but is not located near the correct information.

Average difficulty value of tasks in this level: 298
Percentage of labor force performing in this level: 35%

One of the easier Level 3 tasks requires the reader to write a brief letter explaining that an error has been made on a credit card bill. This task is at 280 on the prose scale. Other tasks in this level require the reader to search fairly dense text for information. Some of the tasks ask respondents to make a literal or synonymous match on more than a single feature, while other tasks ask them to integrate multiple pieces of information from a long passage that does not contain organizational aids.

One of the more difficult Level 3 tasks (with a difficulty value of 316) requires the reader to read a magazine article about an Asian-American woman and to provide two facts that support an inference made from the text. The question directs the reader to identify what Ida Chen did to help resolve conflicts due to discrimination.

List two things that Chen became involved in or has done to help resolve conflicts due to discrimination.

IDA CHEN is the first Asian-American woman to become a judge of the Commonwealth of Pennsylvania.

She understands discrimination because she has experienced it herself.

Soft-spoken and eminently dignified, Judge Ida Chen prefers hearing about a new acquaintance rather than talking about herself. She wants to know about career plans, hopes, dreams, fears. She gives unsolicited advice as well as encouragement. She instills confidence.

Her father once hoped that she would become a professor. And she would have also made an outstanding social worker or guidance counselor. The truth is that Chen wears the caps of all these professions as a Family Court judge of the Court of Common Pleas of Philadelphia County, as a participant in public advocacy for minorities, and as a particularly sensitive, caring person.

She understands discrimination because she has experienced it herself. As an elementary school student, Chen tried to join the local Brownie troop. "You can't be a member," she was told. "Only American girls are in the Brownies."

Originally intent upon a career as a journalist, she selected Temple University because of its outstanding journalism department and affordable tuition. Independence being a personal need, she paid for her tuition by working for Temple's Department of Criminal Justice. There she had her first encounter with the legal world and it turned her career plans in a new direction — law school.

Through meticulous planning, Chen was able to earn her undergraduate degree in two and a half years and she continued to work three jobs. But when she began her first semester as a Temple law student in the fall of 1973, she was barely able to stay awake. Her teacher Lynne Abraham, now a Common Pleas Court judge herself, couldn't help but notice Chen yawning in the back of the class, and when she determined that this student was not a party animal but a workhorse, she arranged a teaching assistant's job for Chen on campus.

After graduating from Temple Law School in 1976, Chen worked for the U.S. Equal Employment Opportunity Commission where she was a litigator on behalf of plaintiffs who experienced discrimination in the workplace, and then moved on to become the first Asian-American to serve on the Philadelphia Commission on Human Relations.

Appointed by Mayor Wilson Goode, Chen worked with community leaders to resolve racial and ethnic tensions and also made time to contribute free legal counsel to a variety of activist groups.

The "Help Wanted" section of the newspaper contained an entry that aroused Chen's curiosity — an ad for a judge's position. Her application resulted in her selection by a state judicial committee to fill a seat in the state court. And in July of 1988, she officially became a judge of the Court of Common Pleas. Running as both a Republican and Democratic candidate, her position was secured when she won her seat on the bench at last November's election.

At Family Court, Chen presides over criminal and civil cases which include adult sex crimes, domestic violence, juvenile delinquency, custody, divorce and support. Not a pretty picture.

Chen recalls her first day as judge, hearing a juvenile dependency case — "It was a horrifying experience. I broke down because the cases were so depressing," she remembers.

Outside of the courtroom, Chen has made a name for herself in resolving interracial conflicts, while glorying in her Chinese-American identity. In a 1986 incident involving the desecration of Korean street signs in a Philadelphia neighborhood, Chen called for a meeting with the leaders of that community to help resolve the conflict.

Chen's interest in community advocacy is not limited to Asian communities. She has been involved in Hispanic, Jewish and Black issues, and because of her participation in the Ethnic Affairs Committee of the Anti-Defamation League of B'nai B'rith, Chen was one of 10 women nationwide selected to take part in a mission to Israel.

With her recently won mandate to judicate in the affairs of Pennsylvania's citizens, Chen has pledged to work tirelessly to defend the rights of its people and contribute to the improvement of human welfare. She would have made a fabulous Brownie.

— Jessica Schultz

Prose Level 4 Scale range: 326 to 375

These tasks require readers to perform multiple-feature matches and to integrate or synthesize information from complex or lengthy passages. More complex inferences are needed to perform successfully. Conditional information is frequently present in tasks in this level and must be taken into consideration by the reader.

Average difficulty value of tasks in this level: 352
Percentage of labor force performing in this level: 21%

A prose task with a difficulty value of 328 requires the reader to synthesize the repeated statements of an argument from a newspaper column in order to generate a theme or organizing principle. In this instance, the supporting statements are elaborated in different parts of a lengthy text.

A more challenging task (with a difficulty value of 359) directs the reader to contrast the two opposing views stated in the newspaper feature reprinted here that discusses the existence of technologies that can be used to produce more fuel-efficient cars.

Contrast Dewey's and Hanna's views about the existence of technologies that can be used to produce more fuel-efficient cars while maintaining the size of the cars.

Face-Off: Getting More Miles Per Gallon

Demand cars with better gas mileage

By Robert Dewey
Guest columnist

WASHINGTON — Warning: Automakers are resurrecting their heavy-metal dinosaurs, aka gas guzzlers.

Government reports show that average new-car mileage has declined to 28.2 miles per gallon — the 1986 level. To reverse this trend, Congress must significantly increase existing gas-mileage standards.

More than half our Nobel laureates and 700 members of the National Academy of Sciences recently called global warming "the most serious environmental threat of the 21st century." In 1989, oil imports climbed to a near-record 46% of U.S. consumption. Increasing gas mileage is the single biggest step we can take to reduce oil imports and curb global warming. Greater efficiency also lowers our trade deficit (oil imports represent 40% of it) and decreases the need to drill in pristine areas.

Bigger engines and bigger cars mean bigger profits for automakers, who offer us the products they want us to buy. More than ever, Americans want products that have less of an environmental impact. But with only a few fuel-efficient cars to choose from, how do we find ones that meet all our needs?

Government studies show automakers have the technology to dramatically improve gas mileage — while maintaining the 1987 levels of comfort, performance and size mix of vehicles. Automakers also have the ability to make their products safer. The cost of these improvements will be offset by savings at the gas pump!

Cars can average 45 mpg and light trucks 35 mpg primarily by utilizing engine and transmission technologies already on a few cars today. Further improvements are possible by using technologies like the two-stroke engine and better aerodynamics that have been developed but not used.

When the current vehicle efficiency standards were proposed in 1974, Ford wrongly predicted that they "would require either all sub-Pinto-sized vehicles or some mix of vehicles ranging from a sub-subcompact to perhaps a Maverick." At that time, Congress required a 100% efficiency increase; raising gas mileage to 45 mpg requires only a 60% increase.

Americans want comfortable, safe and efficient cars. If automakers won't provide them, Congress must mandate them when it considers the issue this summer.

Let's hope lawmakers put the best interest of the environment and the nation ahead of the automakers' lobbyists and political action committees.

Robert Dewey is a conservation analyst for the Environmental Action Foundation.

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Don't demand end to cars people want

By Thomas H. Hanna
Guest columnist

DETROIT — Do Americans look forward to the day when they'll have to haul groceries, shuttle the kids to and from school or take family vacations in compact and subcompact cars?

I doubt it — which is why U.S. and import carmakers oppose the 40-miles-per-gallon to 45 mpg corporate average fuel economy mandates that some are pushing in Congress, either to curb tailpipe carbon dioxide emissions because of alleged global warming or for energy conservation.

Since the mid-1970s, automakers have doubled the fleet average fuel economy of new cars to 28 mpg — and further progress will be made.

Compact and subcompact cars with mileage of 40 mpg or better are now available, yet they appeal to only 5% of U.S. car buyers.

But to achieve a U.S. fleet average of 40 mpg to 45 mpg, carmakers would have to sharply limit the availability of family-size models and dramatically trim the size and weight of most cars.

There simply are not magic technologies to meet such a standard.

Almost every car now sold in the USA would have to be drastically downsized, and many would be obsolete.

As a result, Americans each year would be unable to buy the vehicles most suited for their needs: mid- and family-size models, luxury automobiles, mini-vans, small trucks and utility vehicles.

The fleet shift to compacts and subcompacts could also force the closing of assembly plants, supplier firms and dealerships, at a cost of thousands of U.S. jobs.

Although a growing number of scientists are skeptical of global warming, the issue deserves thorough international scientific evaluation, not premature unilateral U.S. action.

Carbon dioxide emissions from U.S. vehicles total less than 2.5% of worldwide "greenhouse" gases. Even doubling today's corporate average fuel economy for U.S. cars — if technically possible — would cut those gases about .5%

Whatever the motivation — alleged global warming or energy conservation — the stakes are high for millions of Americans and thousands of U.S. jobs in unrealistic corporate average fuel economy mandates.

Thomas H. Hanna is president and chief executive officer of the Motor Vehicle Manufacturers Association of the United States.

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Two other tasks in Level 4 on the prose scale require the reader to draw on background knowledge in responding to questions asked about two poems. In one they are asked to generate an unfamiliar theme from a short poem (difficulty value of 362), and in the other they are asked to compare two metaphors (value of 374).

Prose Level 5 Scale range: 376 to 500

Some tasks in this level require the reader to search for information in dense text which contains a number of plausible distractors. Others ask readers to make high-level inferences or use specialized background knowledge. Some tasks ask readers to contrast complex information.

Average difficulty value of tasks in this level: 423
Percentage of labor force performing in this level: 4%

Two tasks in Level 5 require the reader to search for information in dense text containing several plausible distractors. One such task (difficulty value of 410) requires the respondent to read information about jury selection and service. The question requires the reader to interpret information to identify two ways in which prospective jurors may be challenged.

Identify and summarize the two kinds of challenges
that attorneys use while selecting members of a jury.

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DO YOU HAVE A QUESTION?

QUESTION: What is the new program for scheduling jurors?

ANSWER: This is a new way of organizing and scheduling jurors that is being introduced all over the country. The goals of this program are to save money, increase the number of citizens who are summoned to serve and decrease the inconvenience of serving.

The program means that instead of calling jurors for two weeks, jurors now serve only one day, or for the length of one trial if they are selected to hear a case. Jurors who are not selected to hear a case are excused at the end of the day, and their obligations to serve as jurors are fulfilled for three years. The average trial lasts two days once testimony begins.

An important part of what is called the One Day – One Trial program is the "standby" juror. This is a person called to the Courthouse if the number of cases to be tried requires more jurors than originally estimated. Once called to the Courthouse, the standby becomes a "regular" juror, and his or her service is complete at the end of one day or one trial, the same as everyone else.

Q. How was i summoned?

A. The basic source for names of eligible jurors is the Driver's License list which is supplemented by the voter registration list. Names are chosen from these combined lists by a computer in a completely random manner.

Once in the Courthouse, jurors are selected for a trial by this same computer and random selection process.

Q. How is the Jury for a particular trial selected?

A. When a group of prospective jurors is selected, more than the number needed for a trial are called. Once this group has been seated in the courtroom, either the Judge or the attorneys ask questions. This is called *voir dire*. The purpose of questions asked during *voir dire* is to ensure that all of the jurors who are selected to hear the case will be unbiased, objective and attentive.

In most cases, prospective jurors will be asked to raise their hands when a particular question applies to them. Examples of questions often asked are: Do you know the Plaintiff, Defendant or the attorneys in this case? Have you been involved in a case similar to this one yourself? Where the answer is yes, the jurors raising hands may be asked additional questions, as the purpose is to guarantee a fair trial for all parties. When an attorney believes that there is a legal reason to excuse a juror, he or she will challenge the juror for cause. Unless both attorneys agree that the juror should be excused, the Judge must either sustain or override the challenge.

After all challenges for cause have been ruled upon, the attorneys will select the trial jury from those who remain by exercising peremptory challenges. Unlike challenges for cause, no reason need be given for excusing a juror by peremptory challenge. Attorneys usually exercise these challenges by taking turns striking names from a list until both are satisfied with the jurors at the top of the list or until they use up the number of challenges allowed. Challenged jurors and any extra jurors will then be excused and asked to return to the jury selection room.

Jurors should not feel rejected or insulted if they are excused for cause by the Court or peremptorily challenged by one of the attorneys. The *voir dire* process and challenging of jurors is simply our judicial system's way of guaranteeing both parties to a lawsuit a fair trial.

Q. Am I guaranteed to serve on a jury?

A. Not all jurors who are summoned actually hear a case. Sometimes all the Judges are still working on trials from the previous day, and no new jurors are chosen. Normally, however, some new cases begin every day. Sometimes jurors are challenged and not selected.

A somewhat more demanding task (difficulty value of 423) involves the magazine article on Ida Chen reproduced earlier. This more challenging task requires the reader to explain the phrase "recently won mandate" used at the end of the text. To explain this phrase, the reader needs to understand the concept of a political mandate as it applies to Ida Chen and the way she is portrayed in this article.

Document literacy

Another important aspect of being literate in modern society is having the knowledge and skills needed to process information from documents. We often encounter tables, schedules, charts, graphs, maps, and forms in everyday life, both at home and at work. In fact, researchers have found that many of us spend more time reading documents than any other type of material.[2] The ability to locate and use information from documents is therefore essential.

Success in processing documents appears to depend at least in part on the ability to locate information in complex arrays and to use this information in the appropriate ways. Procedural knowledge may be needed to transfer information from one source or document to another, as is necessary in completing applications or order forms.

The document literacy scale contains 81 tasks with difficulty values that range from 69 to 396 on the scale. By examining tasks associated with various proficiency levels, we can identify characteristics that appear to make certain types of document tasks more or less difficult for readers. Questions and directives associated with these tasks are basically of four types: ***locating, cycling, integrating, and generating***. Locating tasks require the readers to match one or more features of information stated in the question to either identical or synonymous information given in the document. Cycling tasks require the reader to locate and match one or more features, but differ in that they require the reader to engage in a series of feature matches to satisfy conditions given in the question. The integrating tasks typically require the reader to compare and contrast information in adjacent parts of the document. In the generating tasks, readers must produce a written response by processing information found in the document and also making text-based inferences or drawing on their own background knowledge.

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[2] J T. Guthrie, M. Seifert, and I.S. Kirsch. (1986). "Effects of Education, Occupation, and Setting on Reading Practices." **American Educational Research Journal**. 23 pp. 151-160.

As with the prose tasks, each type of question or directive extends over a range of difficulty as a result of interactions among several variables or task characteristics that include:

- the number of categories or features of information in the question that the reader has to process or match
- the number of categories or features of information in the document that can serve to distract the reader or that may seem plausible but are incorrect
- the extent to which the information asked for in the question is obviously related to the information stated in the document and
- the structure of the document

A more detailed discussion of the five levels of document literacy is provided in the following pages.

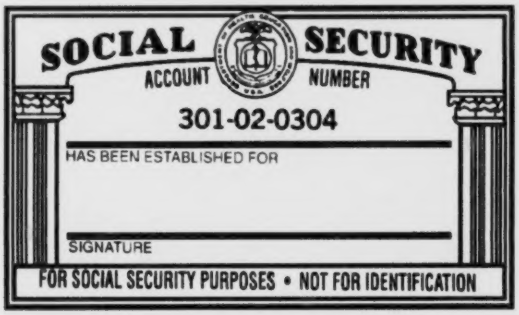
Document Level 1 Scale range: 0 to 225

Tasks in this level tend to require the reader either to locate a piece of information based on a literal match or to enter information from personal knowledge onto a document. Little, if any, distracting information is present.

Average difficulty value of tasks in this level: 195
Percentage of labor force performing in this level: 16%

Some of the Level 1 tasks require the reader to match one piece of information in the directive with an identical or synonymous piece of information in the document. For example, readers may be asked to write a piece of personal background information — such as their name or age — in the appropriate place on a document. One task with a difficulty value of 69 directs individuals to look at a Social Security card and sign their name on the line marked "signature." Tasks such as this are quite simple, since only one piece of information is required, it is known to the respondent, and there is only one logical place on the document where it may be entered.

Here is a Social Security card. Sign your name on the line that reads "signature."



SOCIAL SECURITY

ACCOUNT NUMBER

301-02-0304

HAS BEEN ESTABLISHED FOR

SIGNATURE

FOR SOCIAL SECURITY PURPOSES • NOT FOR IDENTIFICATION

Other tasks in this level are slightly more complex. For example, in one task, readers were asked to complete a section of a job application by providing several pieces of information. This was more complicated than the previous task described, since respondents had to conduct a series of one-feature matches. As a result, the difficulty value of this task was higher (218).

You have gone to an employment center for help in finding a job. You know that this center handles many different kinds of jobs. Also, several of your friends who have applied here have found jobs that appeal to you.

The agent has taken your name and address and given you the rest of the form to fill out. Complete the form so the employment center can help you get a job.

Birth date ____________ Age _____ Sex: Male ___ Female___

Height _______ Weight_______ Health ____________

Last grade completed in school ____________

Kind of work wanted:

Part-time _______ Summer _______

Full-time _______ Year-round _______

Other tasks in this level ask the reader to locate specific elements in a document that contains a variety of information. In one task, for example, respondents were given a form providing details about a meeting and asked to indicate the date and time of the meeting, which were stated in the form. The difficulty values associated with these tasks were 183 and 180, respectively. The necessary information was referred to only once in the document.

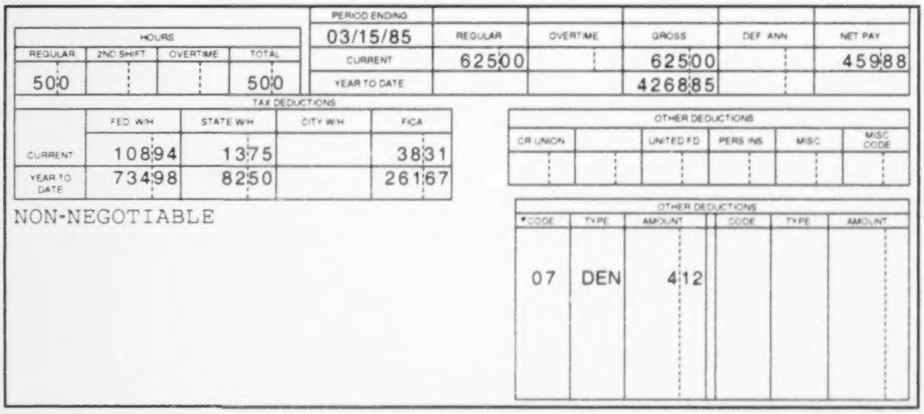
Document Level 2 Scale range: 226 to 275

Tasks in this level are more varied than those in Level 1. Some require the reader to match a single piece of information; however, several distractors may be present, or the match may require low-level inferences. Tasks in this level may also ask the reader to cycle through information in a document or to integrate information from various parts of a document.

Average difficulty value of tasks in this level: 249
Percentage of labor force performing in this level: 27%

Some tasks in Level 2 ask readers to match two pieces of information in the text. For example, one task with a difficulty value of 261 directs the respondent to look at a pay stub and to write "the gross pay for this year to date." To perform the task successfully, respondents must match both "gross pay" and "year to date" correctly. If readers fail to match on both features, they are likely to indicate an incorrect amount.

What is the gross pay for this year to date?



HOURS			
REGULAR	2ND SHIFT	OVERTIME	TOTAL
500			500

PERIOD ENDING					
03/15/85	REGULAR	OVERTIME	GROSS	DEF ANN	NET PAY
CURRENT	62500		62500		45988
YEAR TO DATE			426885		

TAX DEDUCTIONS

	FED W/H	STATE W/H	CITY W/H	FICA
CURRENT	10894	1375		3831
YEAR TO DATE	73498	8250		26167

NON-NEGOTIABLE

OTHER DEDUCTIONS

CR UNION		UNITED FD	PERS INS	MISC	MISC CODE

OTHER DEDUCTIONS

*CODE	TYPE	AMOUNT	CODE	TYPE	AMOUNT
07	DEN	412			

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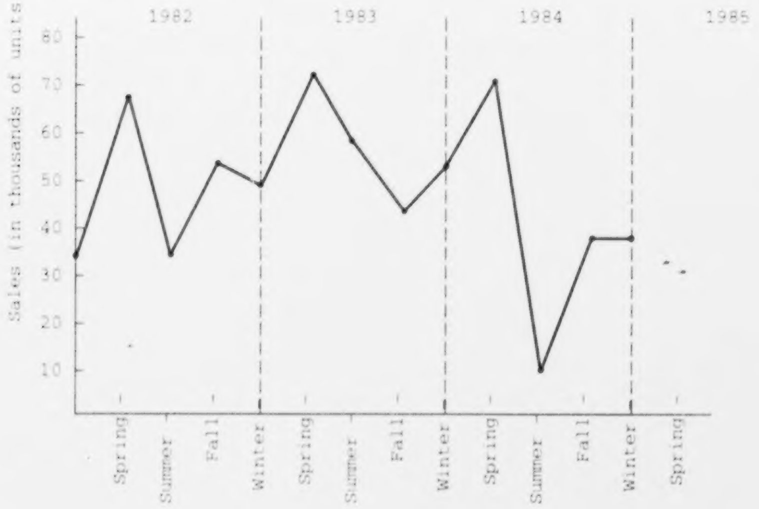
A second question based on this document — What is the current net pay? — was also expected to require readers to make a two-feature match. Accordingly, the difficulty values of the two items were expected to be similar. The task anchored at about the 200 point on the scale, however, and an analysis of the pay stub reveals why its difficulty was lower than that of the previous task. To succeed on the second task, the reader only needs to match on the feature "net pay." Since the term appears only once on the pay stub and there is only one number in the column, this task requires only a one-feature match and receives a difficulty value that lies within the Level 1 range on the document scale.

Tasks in Level 2 may also require the reader to integrate information from different parts of the document by looking for similarities or differences. For example, a task with a difficulty value of 268 asks respondents to study a line graph showing a company's seasonal sales over a three-year period, then predict the level of sales for the following year, based on the seasonal trends shown in the graph.

You are a marketing manager for a small manufacturing firm. This graph shows your company's sales over the last three years. Given the seasonal pattern shown on the graph, predict the sales for Spring 1985 (in thousands) by putting an "x" on the graph.



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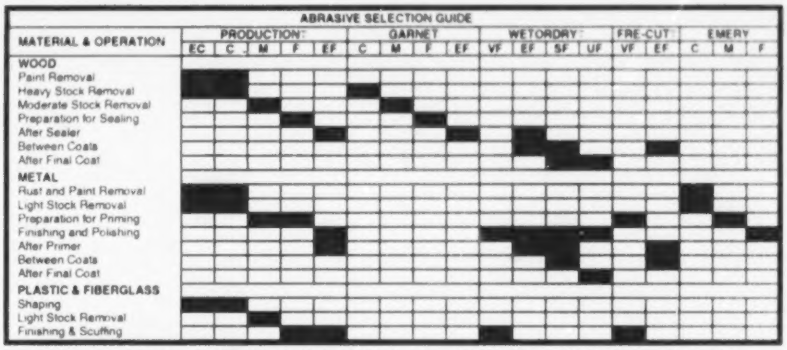
Document Level 3 Scale range: 276 to 325

Some tasks in this level require the reader to integrate multiple pieces of information from one or more documents. Others ask readers to cycle through rather complex tables or graphs which contain information that is irrelevant or inappropriate to the task.

Average difficulty value of tasks in this level: 302
Percentage of labor force performing in this level: 35%

Tasks within the range for Level 3 ask the reader to locate particular features in complex displays, such as tables that contain nested information. Typically, distractor information is present in the same row or column as the correct answer. For example, the reader might be asked to use a table that summarizes appropriate uses for a variety of products, and then choose which product to use for a certain project. One such task had a difficulty value of 305. To perform this task successfully, the respondent uses a table containing nested information to determine the type of sandpaper to buy if one needs "to smooth wood in preparation for sealing and plans to buy garnet sandpaper." This task requires matching not only on more than a single feature of information but also on features that are not always superordinate categories in the document. For example, "preparation for sealing" is subordinated or nested under the category "wood," while the type of sandpaper is under the main heading of "garnet." In addition, there are three other types of sandpaper that the reader might select that partially satisfy the directive.

You need to smooth wood in preparation for sealing and plan to buy garnet sandpaper. What type of sandpaper should you buy?



ABRASIVE SELECTION GUIDE

MATERIAL & OPERATION	PRODUCTION					GARNET				WETORDRY				FRE-CUT		EMERY		
	EC	C	M	F	EF	C	M	F	EF	VF	EF	SF	UF	VF	EF	C	M	F
WOOD																		
Paint Removal	■	■																
Heavy Stock Removal	■	■				■												
Moderate Stock Removal			■				■											
Preparation for Sealing				■				■										
After Sealer					■				■		■							
Between Coats											■	■			■			
After Final Coat												■	■					
METAL																		
Rust and Paint Removal	■	■														■		
Light Stock Removal	■	■														■		
Preparation for Priming			■	■										■			■	
Finishing and Polishing					■					■	■	■	■					■
After Primer					■						■	■			■			
Between Coats												■			■			
After Final Coat													■					
PLASTIC & FIBERGLASS																		
Shaping	■	■																
Light Stock Removal			■															
Finishing & Scuffing				■	■					■				■				

EC = Extra Coarse **C** = Coarse **M** = Medium **F** = Fine **VF** = Very Fine **EF** = Extra Fine **SF** = Super Fine **UF** = Ultra Fine

SAFETY INFORMATION:
- Wear approved safety goggles when sanding
- Use particle/dust mask or other means to prevent inhalation of sanding dust
- When using power tools, follow manufacturer's recommended procedures and safety instructions

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At the same level of difficulty (306), another task directs the reader to a stacked bar graph depicting estimated power consumption by source for four different years. The reader is asked to select an energy source that will provide more power in the year 2000 than it did in 1971. To succeed on this task, the reader must first identify the correct years and then compare each of the five pairs of energy sources given.

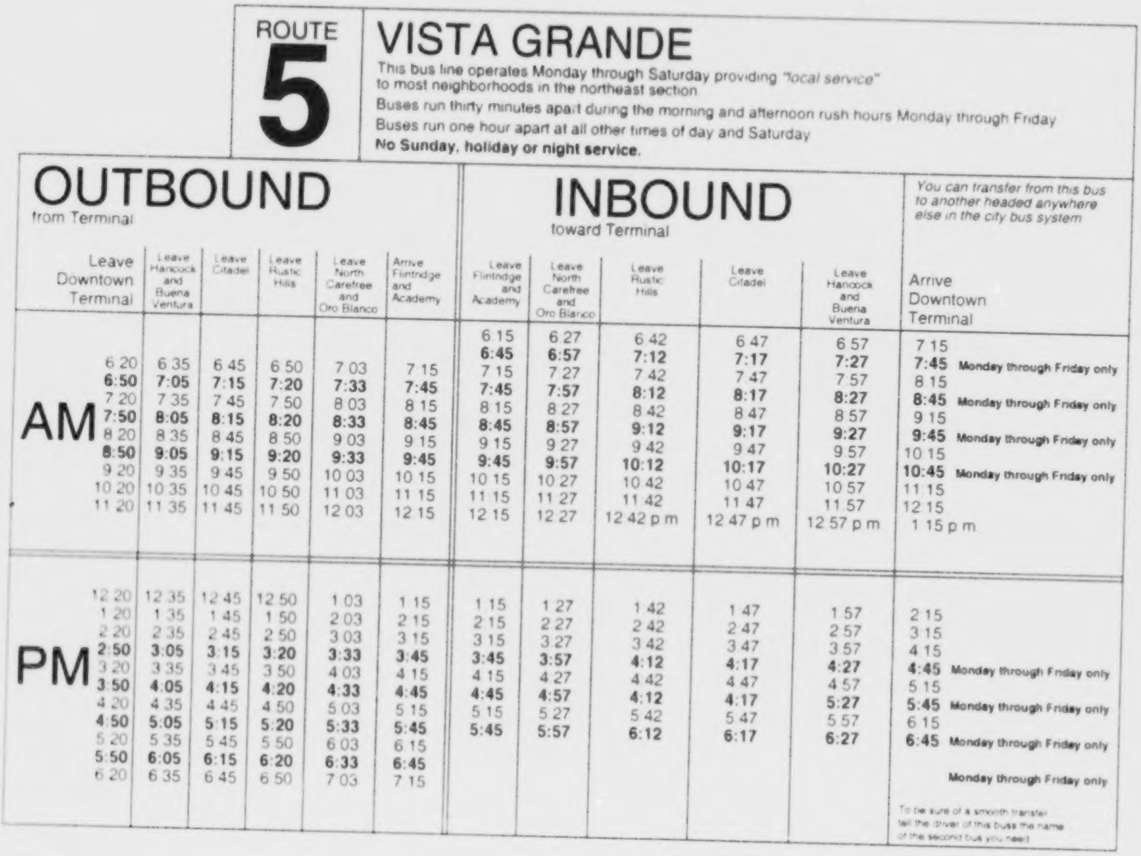
Document Level 4 Scale range: 326 to 375

Tasks in this level, like those in the previous levels, ask readers to perform multiple-feature matches, cycle through documents, and integrate information; however, they require a greater degree of inferencing. Many of these tasks require readers to provide numerous responses but do not designate how many responses are needed. Conditional information is also present in the document tasks in this level and must be taken into account by the reader.

Average difficulty value of tasks in this level: 340
Percentage of labor force performing in this level: 19%

One task in this level (348) combines many of the variables that contribute to difficulty in Level 4. These include: multiple feature matching, complex displays involving nested information, numerous distractors, and conditional information that must be taken into account in order to arrive at a correct response. Using the bus schedule shown here, readers are asked to select the time of the next bus on a Saturday afternoon, if they miss the 2:35 bus leaving Hancock and Buena Ventura going to Flintridge and Academy. Several departure times are given, from which respondents must choose the correct one.

On Saturday afternoon, if you miss the 2:35 bus leaving Hancock and Buena Ventura going to Flintridge and Academy, how long will you have to wait for the next bus?



ROUTE
5

VISTA GRANDE

This bus line operates Monday through Saturday providing *"local service"* to most neighborhoods in the northeast section

Buses run thirty minutes apart during the morning and afternoon rush hours Monday through Friday

Buses run one hour apart at all other times of day and Saturday

No Sunday, holiday or night service.

OUTBOUND

from Terminal

	Leave Downtown Terminal	Leave Hancock and Buena Ventura	Leave Citadel	Leave Rustic Hills	Leave North Carefree and Oro Blanco	Arrive Flintridge and Academy
AM	6 20	6 35	6 45	6 50	7 03	7 15
	6:50	**7:05**	**7:15**	**7:20**	**7:33**	**7:45**
	7 20	7 35	7 45	7 50	8 03	8 15
	7:50	**8:05**	**8:15**	**8:20**	**8:33**	**8:45**
	8 20	8 35	8 45	8 50	9 03	9 15
	8:50	**9:05**	**9:15**	**9:20**	**9:33**	**9:45**
	9 20	9 35	9 45	9 50	10 03	10 15
	10 20	10 35	10 45	10 50	11 03	11 15
	11 20	11 35	11 45	11 50	12 03	12 15
PM	12 20	12 35	12 45	12 50	1 03	1 15
	1 20	1 35	1 45	1 50	2 03	2 15
	2 20	2 35	2 45	2 50	3 03	3 15
	2:50	**3:05**	**3:15**	**3:20**	**3:33**	**3:45**
	3 20	3 35	3 45	3 50	4 03	4 15
	3:50	**4:05**	**4:15**	**4:20**	**4:33**	**4:45**
	4 20	4 35	4 45	4 50	5 03	5 15
	4:50	**5:05**	**5:15**	**5:20**	**5:33**	**5:45**
	5 20	5 35	5 45	5 50	6 03	6 15
	5:50	**6:05**	**6:15**	**6:20**	**6:33**	**6:45**
	6 20	6 35	6 45	6 50	7 03	7 15

INBOUND

toward Terminal

You can transfer from this bus to another headed anywhere else in the city bus system

	Leave Flintridge and Academy	Leave North Carefree and Oro Blanco	Leave Rustic Hills	Leave Citadel	Leave Hancock and Buena Ventura	Arrive Downtown Terminal
AM	6 15	6 27	6 42	6 47	6 57	7 15
	6:45	**6:57**	**7:12**	**7:17**	**7:27**	**7:45** **Monday through Friday only**
	7 15	7 27	7 42	7 47	7 57	8 15
	7:45	**7:57**	**8:12**	**8:17**	**8:27**	**8:45** **Monday through Friday only**
	8 15	8 27	8 42	8 47	8 57	9 15
	8:45	**8:57**	**9:12**	**9:17**	**9:27**	**9:45** **Monday through Friday only**
	9 15	9 27	9 42	9 47	9 57	10 15
	9:45	**9:57**	**10:12**	**10:17**	**10:27**	**10:45** **Monday through Friday only**
	10 15	10 27	10 42	10 47	10 57	11 15
	11 15	11 27	11 42	11 47	11 57	12 15
	12 15	12 27	12 42 p m	12 47 p m	12 57 p m	1 15 p m
PM	1 15	1 27	1 42	1 47	1 57	2 15
	2 15	2 27	2 42	2 47	2 57	3 15
	3 15	3 27	3 42	3 47	3 57	4 15
	3:45	**3:57**	**4:12**	**4:17**	**4:27**	**4:45** **Monday through Friday only**
	4 15	4 27	4 42	4 47	4 57	5 15
	4:45	**4:57**	**4:12**	**4:17**	**5:27**	**5:45** **Monday through Friday only**
	5 15	5 27	5 42	5 47	5 57	6 15
	5:45	**5:57**	**6:12**	**6:17**	**6:27**	**6:45** **Monday through Friday only**
						Monday through Friday only

To be sure of a smooth transfer tell the driver of this buss the name of the second bus you need

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Other tasks involving this bus schedule are found in Level 3. These tasks require the reader to match on fewer features of information and do not involve the use of conditional information.

Document Level 5 Scale range: 376 to 500

Tasks in this level require the reader to search through complex displays that contain multiple distractors, to make high-level text-based inferences, and to use specialized knowledge.

Average difficulty value of tasks in this level: 391
Percentage of labor force performing in this level: 3%

A task receiving a difficulty value of 396 involves reading and understanding a table depicting the results from a survey of parents and teachers evaluating parental involvement in their school. Respondents were asked to write a brief paragraph summarizing the results. This particular task requires readers to integrate the information in the table to compare and contrast the viewpoints of parents and teachers on a selected number of school issues.

Using the information in the table, write a brief paragraph summarizing the extent to which parents and teachers agreed or disagreed on the statements about issues pertaining to parental involvement at their school.

Parents and Teachers Evaluate Parental Involvement at Their School

Do you agree or disagree that . . . ?

	Total	Level of School		
		Elementary	Junior High	High School
			percent agreeing	
Our school does a good job of encouraging parental involvement in sports, arts, and other nonsubject areas				
Parents	77	76	74	79
Teachers	77	73	77	85
Our school does a good job of encouraging parental involvement in educational areas				
Parents	73	82	71	64
Teachers	80	84	78	70
Our school only contacts parents when there is a problem with their child				
Parents	55	46	62	63
Teachers	23	18	22	33
Our school does not give parents the opportunity for any meaningful roles				
Parents	22	18	22	28
Teachers	8	8	12	7

Source: The Metropolitan Life Survey of the American Teacher, 1987

Quantitative literacy

Since adults are often required to perform numerical operations in everyday life, the ability to perform quantitative tasks is another important aspect of literacy. These abilities may seem, at first glance, to be fundamentally different from the types of skills involved in reading prose and documents and, therefore, to extend the concept of literacy beyond its traditional limits. However, research indicates that the processing of printed information plays a critical role in affecting the difficulty of tasks along this scale.[3]

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[3] I.S. Kirsch and A. Jungeblut. (1986). *Literacy: Profiles of America's Young Adults. Final Report.* Princeton, NJ: Educational Testing Service. I.S. Kirsch, A. Jungeblut, and A. Campbell. (1992). *Beyond the School Doors: The Literacy Needs of Job Seekers Served by the U.S. Department of Labor.* Princeton, NJ: Educational Testing Service.

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The quantitative literacy scale contains some 39 tasks with difficulty values that range from 191 to 436. The difficulty of these tasks appears to be a function of several factors, including:

- the particular arithmetic operation called for
- the number of operations needed to perform the task
- the extent to which the numbers are embedded in printed materials and
- the extent to which an inference must be made to identify the type of operation to be performed

In general, it appears that many individuals can perform simple arithmetic operations when both the numbers and operations are made explicit. However, when the numbers to be used must be located in and extracted from different types of documents that contain similar but irrelevant information, or when the operations to be used must be inferred from printed directions, the tasks become increasingly difficult.

A detailed discussion of the five levels of quantitative literacy is provided on the following pages.

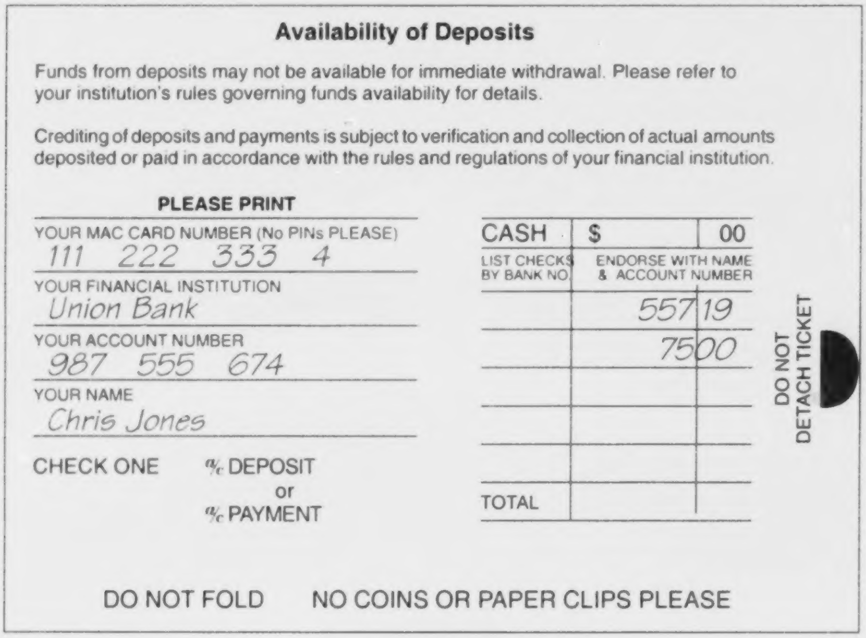
Quantitative Level 1 Scale range: 0 to 225

Tasks in this level require readers to perform single, relatively simple arithmetic operations, such as addition. The numbers to be used are provided and the arithmetic operation to be performed is specified.

Average difficulty value of tasks in this level: 206
Percentage of labor force performing in this level: 15%

The least demanding task on the quantitative scale (191) requires the reader to total two numbers on a bank deposit slip. In this task, both the numbers and the arithmetic operation are judged to be easily identified and the operation involves the simple addition of two decimal numbers that are set up in column format.

You wish to use the automatic teller machine at your bank to make a deposit. Figure the total amount of the two checks being deposited. Enter the amount on the form in the space next to TOTAL.



Availability of Deposits

Funds from deposits may not be available for immediate withdrawal. Please refer to your institution's rules governing funds availability for details.

Crediting of deposits and payments is subject to verification and collection of actual amounts deposited or paid in accordance with the rules and regulations of your financial institution.

PLEASE PRINT

YOUR MAC CARD NUMBER (No PINs PLEASE) 111 222 333 4

YOUR FINANCIAL INSTITUTION Union Bank

YOUR ACCOUNT NUMBER 987 555 674

YOUR NAME Chris Jones

CHECK ONE %c DEPOSIT or %c PAYMENT

CASH	$	00
LIST CHECKS BY BANK NO.	ENDORSE WITH NAME & ACCOUNT NUMBER	
	557	19
	75	00
TOTAL		

DO NOT DETACH TICKET

DO NOT FOLD NO COINS OR PAPER CLIPS PLEASE

Quantitative Level 2 Scale range: 226 to 275

Tasks in this level typically require readers to perform a single operation using numbers that are either stated in the task or easily located in the material. The operation to be performed may be stated in the question or easily determined from the format of the material (for example, an order form).

Average difficulty value of tasks in this level: 251
Percentage of labor force performing in this level: 25%

In the easier tasks in Level 2, the quantities are also easy to locate. In one such task at 250 on the quantitative scale, the cost of a ticket and bus is given for each of two shows. The reader is directed to determine how much less attending one show will cost in comparison to the other.

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The price of one ticket and bus for "Sleuth" costs how much less than the price of one ticket and bus for "On the Town"?

THEATER TRIP

A charter bus will leave from the bus stop (near the Conference Center) at 4 p.m., giving you plenty of time for dinner in New York. Return trip will start from West 45th Street directly following the plays. Both theaters are on West 45th Street. Allow about 1½ hours for the return trip.

Time:	4 p.m., Saturday, November 20		
Price:	"On the Town"	Ticket and bus	$11.00
	"Sleuth"	Ticket and bus	$8.50
Limit:	Two tickets per person		

In a more complex set of tasks, the reader is directed to complete an order form for office supplies using a page from a catalogue. No other specific instructions as to what parts of the form should be completed are given in the directive. One task (difficulty value of 270) requires the reader to use a table on the form to locate the appropriate shipping charges based on the amount of a specified set of office supplies, to enter the correct amount on an order form, and then to calculate the total price of the supplies.

Quantitative Level 3 Scale range: 276 to 325

In tasks in this level, two or more numbers are typically needed to solve the problem, and these must be found in the material. The operation(s) needed can be determined from the arithmetic relation terms used in the question or directive.

Average difficulty value of tasks in this level: 293
Percentage of labor force performing in this level: 35%

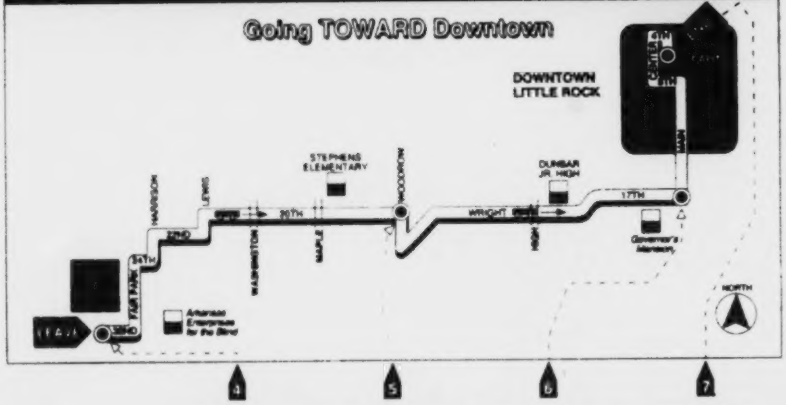
In general, tasks within the range for Level 3 ask the reader to perform a single operation of addition, subtraction, multiplication, or division. However, the operation is not stated explicitly in the directive or made clear by the format of the document. Instead, it must be inferred from the terms used in the directive. These tasks are also more difficult because the reader must locate the numbers in various parts of the document in order to perform the operation.

From a bar graph showing percentages of population growth for two groups across six periods, a task at the 278 point on the scale directs the reader to calculate the difference between the groups for one of the years.

A more difficult task in Level 3 (321) requires the use of a bus schedule to determine how long it takes to travel from one location to another on a Saturday. To respond correctly, the reader must match on several features of information given in the question to locate the appropriate times.

Suppose that you took the 12:45 p.m. bus from U.A.L.R. Student Union to 17th and Main on a Saturday. According to the schedule, how many minutes is the bus ride?

16 South Highland 16


Going TOWARD Downtown
DOWNTOWN LITTLE ROCK
STEPHENS ELEMENTARY
DUNBAR JR. HIGH
Governor's Mansion
Arkansas Enterprises for the Blind
HARRISON
LEWIS
22ND
24TH
FAIR PARK
28TH
20TH
WASHINGTON
MAPLE
WOODROW
WRIGHT
17TH
CENTER
MAIN
NORTH
4
5
6
7

		BUS LEAVES from U.A.L.R. Student Union	Bus arrives at 20th & Woodrow	Bus arrives at 17th & Main	BUS ENDS at Capitol & Louisiana
WEEKDAYS					
A.M.	♿	5:38	5:51	6:00	6:09
		6:11	6:25	6:35	6:45
	♿	6:41	6:55	7:05	7:15
		7:11	7:25	7:35	7:45
	♿	7:41	7:55	8:05	8:15
		8:11	8:25	8:35	8:45
	♿	8:41	8:55	9:05	9:15
		9:14	9:27	9:36	9:45
	♿	9:44	9:57	10:06	10:15
		10:14	10:27	10:36	10:45
	♿	10:44	10:57	11:06	11:15
		11:14	11:27	11:36	11:45
	♿	11:44	11:57	12:06	12:15
P.M.		12:14	12:27	12:36	12:45
	♿	12:44	12:57	1:06	1:15
		1:14	1:27	1:36	1:45
	♿	1:44	1:57	2:06	2:15
		2:14	2:27	2:36	2:45
	♿	2:44	2:57	3:06	3:15
		3:14	3:27	3:36	3:45
	♿	3:43	3:56	4:05	4:15
		4:13	4:26	4:35	4:45
	♿	4:43	4:56	5:05	5:15
		5:13	5:26	5:35	5:45
	♿	5:45	5:58	6:07	6:17
		6:11	6:22	6:30	–
	♿	6:46	6:57	7:05	–
SATURDAY					
A.M.	♿	5:38	5:51	6:00	6:09
	♿	6:45	6:57	7:06	7:15
	♿	7:45	7:57	8:06	8:15
	♿	8:45	8:57	9:06	9:15
	♿	9:45	9:57	10:06	10:15
	♿	10:45	10:57	11:06	11:15
	♿	11:45	11:57	12:06	12:15
P.M.	♿	12:45	12:57	1:06	1:15
	♿	1:45	1:57	2:06	2:15
	♿	2:45	2:57	3:06	3:15
	♿	3:45	3:57	4:06	4:15
	♿	4:45	4:57	5:06	5:15
	♿	5:45	5:57	6:06	6:15
	♿	6:44	6:56	7:05	–

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Quantitative Level 4 Scale range: 326 to 375

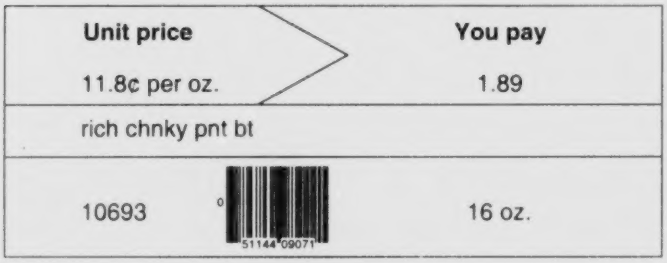
These tasks tend to require readers to perform two or more sequential operations or a single operation in which the quantities are found in different types of displays, or the operations must be inferred from semantic information given or drawn from prior knowledge.

Average difficulty value of tasks in this level: 349
Percentage of labor force performing in this level: 21%

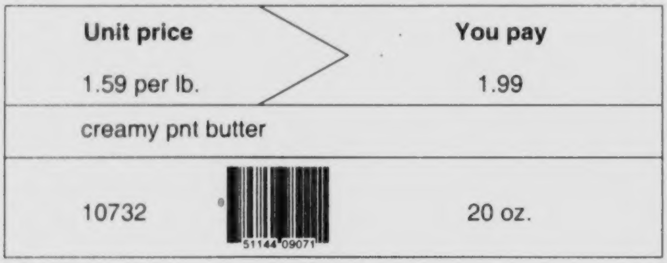
One task in this level, with a difficulty value of 332, asks the reader to estimate, based on information in a news article, how many miles per day a driver covered in a sled-dog race. The respondent must know that to calculate a "per day" rate requires the use of division.

A more difficult task (355) requires the reader to select from two unit price labels to estimate the cost per ounce of creamy peanut butter. To perform this task successfully, readers may have to draw some information from prior knowledge.

Estimate the cost per ounce of the creamy peanut butter. Write your estimate on the line provided.



Unit price
11.8¢ per oz.
You pay
1.89
rich chnky pnt bt
10693
0 51144 09071
16 oz.



Unit price
1.59 per lb.
You pay
1.99
creamy pnt butter
10732
0 51144 09071
20 oz.

Quantitative Level 5 Scale range: 376 to 500

These tasks require readers to perform multiple operations sequentially. They must disembed the features of the problem from text or rely on background knowledge to determine the quantities or operations needed.

Average difficulty value of tasks in this level: 411
Percentage of labor force performing in this level: 5%

One of the most difficult tasks on the quantitative scale (433) requires readers to look at an advertisement for a home equity loan and then, using the information given, explain how they would calculate the total amount of interest charges associated with the loan.

You need to borrow $10,000. Find the ad for Home Equity Loans on page 2 in the newspaper provided. Explain to the interviewer how you would compute the total amount of interest charges you would pay under this loan plan. Please tell the interviewer when you are ready to begin.

FIXED RATE • FIXED TERM

HOME EQUITY LOANS

14.25%
Annual Percentage Rate
Ten Year Term

SAMPLE MONTHLY REPAYMENT SCHEDULE

Amount Financed	Monthly Payment
$10,000	$156.77
$25,000	$391.93
$40,000	$627.09

120 Months 14.25% APR

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Estimating Performance Across the Literacy Levels

The literacy levels not only provide a way to explore the progression of information-processing demands across the scales; they can also be used to explore the likelihood that individuals in each level will succeed on tasks of varying difficulty.

The following graphs (Figure A.2) display the probability that individuals performing at selected points on each scale will give a correct response to tasks with varying difficulty values. We see, for example, that a person whose prose proficiency is 150 has less than a 50 percent chance of giving a correct response to the Level 1 tasks. Individuals whose proficiency scores were at the 200 point, on the other hand, have an almost 80 percent probability of responding correctly to these tasks.

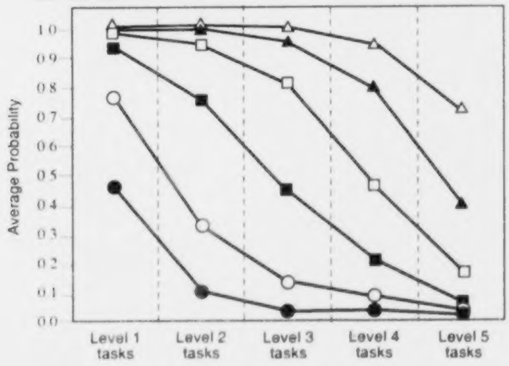
In terms of task demands, we can infer that adults performing at the 200 point on the prose scale are likely to be able to locate a single piece of information in a brief piece of text where there is no distracting information, or when any distracting information is located apart from the desired information. They are likely to have far more difficulty with the types of tasks that occur in Levels 2 through 5, however. For example, they would have only about a 30 percent chance of performing the average task in Level 2 correctly and only about a 10 percent chance of success, or less, on the more challenging tasks found in Levels 3, 4, and 5.

In contrast, readers at the 300 point on the prose scale have an 80 percent (or higher) likelihood of success on tasks in Levels 1, 2, and 3. This means that they demonstrate skill identifying information in fairly dense text without organizational aids. They can also integrate, compare, and contrast information that is easily identified in the text. On the other hand, they are likely to have difficulty with tasks that require them to make higher level inferences, to take conditional information into account, and to use specialized knowledge. The probabilities of their performing these Level 4 tasks successfully are just under 50 percent, and on the Level 5 tasks their likelihood of responding correctly falls to under 20 percent.

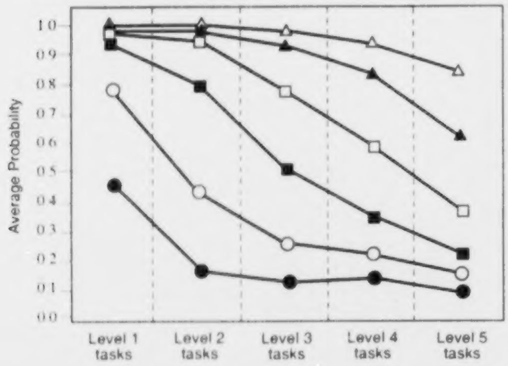
Figure A.2

Average Probabilities of Successful Performance by Individuals with Selected Proficiency Scores on the Tasks in Each Literacy Level

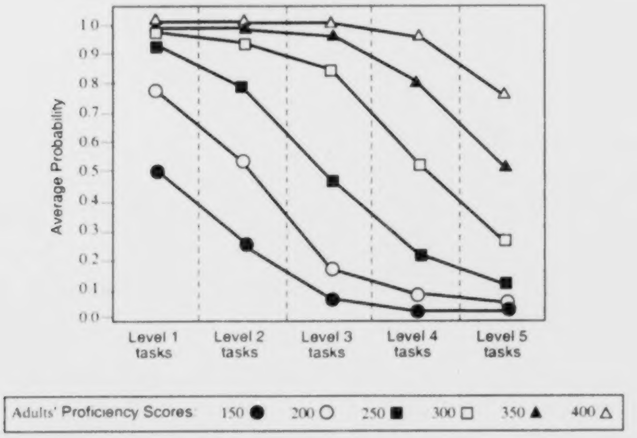
PROSE



DOCUMENT



QUANTITATIVE



Source: U.S. Department of Education, National Center for Education Statistics, National Adult Literacy Survey, 1992

Similar interpretations can be made using the performance results on the document and quantitative scales. For example, an individual with a proficiency of 150 on the quantitative scale is estimated to have only a 50 percent chance of responding correctly to tasks in Level 1 and less than a 30 percent chance of responding to tasks in each of the other levels. Such an individual demonstrates little or no proficiency in performing the range of quantitative tasks found in this assessment. In contrast, someone with a proficiency of 300 meets or exceeds the 80 percent criterion for the average tasks in Levels 1, 2, and 3. They can be expected to encounter more difficulty with tasks in Levels 4 and 5.

Successful Task Performance across the Literacy Levels

The main purpose of the literacy scales is to summarize how well adults can perform on the full array of tasks in the assessment. The difficulty of the assessment tasks increases proportionally with the progression of information-processing demands across the scales. The literacy levels provide a way not only to explore this progression, but also to explore the likelihood that individuals in each level will succeed on tasks of varying difficulty.

The following graphs (Figure A.2) display the probability that individuals performing at selected points on each scale will give a correct response to tasks with varying difficulty values. For example, a person whose prose proficiency is 150 has less than a 50 percent chance of giving a correct response to an average prose task in Level 1, where the average task difficulty is 198. Individuals whose scores were at the 200 point, on the other hand, have an almost 80 percent probability of responding correctly to these tasks.

In terms of task demands, adults performing at the 200 point on the prose scale are likely to be able to locate a single piece of information in a brief piece of text where there is no distracting information, or when any distracting information is located apart from the desired information. They are likely to have far more difficulty with the types of tasks that occur in Levels 2 through 5, however. For example, they would have only about a 30 percent chance of performing the average task in Level 2 correctly, where the average task difficulty value is 259, and only about a 10 percent chance of success, or less, on the more challenging tasks found in Levels 3, 4, and 5.

In contrast, readers at the 300 point on the prose scale have more than an 80 percent probability of success on tasks in Levels 1 and 2, and have close to an 80 percent likelihood of success on tasks in Level 3, where the average task difficulty value is 298. This means that they demonstrate consistent success identifying information in fairly dense text without organizational aids. They can also consistently integrate, compare, and contrast information that is easily identified in the text. On the other hand, they are likely not to have mastered tasks that require them to make higher level inferences, to take conditional information into account, and to use specialized knowledge. The probabilities of their successfully performing these Level 4 tasks, where the average task difficulty value is 352, are just under 50 percent, and on the Level 5 tasks their likelihood of responding correctly falls to less than 20 percent.

Similar interpretations can be made using the performance results on the document and quantitative scales. For example, an individual with a proficiency of 150 on the document scale is estimated to have less than a 50 percent chance of responding correctly to tasks in Level 1, where the average task difficulty value is 195, and less than a 30 percent chance of responding correctly to tasks in each of the higher levels. On the quantitative literacy scale, adults with a proficiency of 150 are estimated to have only a 50 percent chance of responding correctly to an average document task in Level 1, where the average task difficulty is 206, and less than a 30 percent chance of responding correctly to tasks in the other levels. Such individuals demonstrate little or no proficiency in performing the range of quantitative tasks found in this assessment. In contrast, adults with a quantitative score of 300 exceed the 80 percent criterion for the average tasks in Levels 1 and 2 and meet the 80 percent criterion for many of the tasks in Level 3. They can be expected to encounter more difficulty with quantitative tasks in Levels 4 and 5.

Missing Responses to Literacy Tasks

In any educational, social, or political opinion survey, missing responses are always present. Sometimes missing data can be ignored when tabulating and reporting survey results. If the reasons the data are missing are related to the outcome of the study, however, the missing responses will bias the results unless some adjustment can be made to counter the bias. In this survey, there were reasons to believe that the literacy performance data were missing more often for adults with lower levels of literacy than for adults with higher levels. Field test evidence and experience with surveys indicated that adults with lower levels of literacy would be more likely than adults with higher proficiencies either to decline to respond to the survey at all or to begin the assessment but not to complete it. Ignoring the pattern of missing data would have resulted in overestimating the literacy skills of adults in the United States.

For this survey, several procedures were developed to reduce biases due to nonresponse, based on how much of the survey the respondent completed.[3] Individuals who refused to participate in the survey before any information about them was collected were omitted from the analyses. Because they were unlikely to know that the survey intended to assess their literacy, it was assumed that their reason for refusing was not related to their level of literacy skills.

Some individuals began the interview, but stopped before they completed at least five tasks on each literacy scale.[4] The interviewers were trained to record accurately their reasons for stopping. The reasons were subsequently classified as either related or unrelated to literacy skills. Literacy-related reasons included difficulty with reading or writing, inability to read or write in English, and mental or learning disabilities. Reasons unrelated to literacy included physical disabilities, time conflicts, and interruptions. Some adults gave no reason for stopping the assessment.

Overall, 88 percent of respondents completed the assessment (at least five tasks on each literacy scale). Twelve percent started the survey but stopped before completing five tasks. About half of these individuals, or 6 percent of the adult population, did not complete the assessment for reasons related to their literacy skills, while the other 6 percent did not complete it for reasons unrelated to literacy or for no stated reason.

The missing data were treated differently depending on whether nonrespondents' reasons were related or unrelated to their literacy skills. The missing responses of those who gave literacy-related reasons for terminating the assessment were treated as wrong answers, based on the assumption that they could not have correctly completed the literacy tasks. The missing responses of those who broke off the assessment for no stated reason or for reasons unrelated to literacy were essentially ignored, since it could not be assumed that their answers would have been either correct or incorrect. The proficiencies of such respondents were inferred from the performance of other adults with similar characteristics.

Table A.1 shows the proficiency scores resulting from these procedures. Adults who completed the assessment had average proficiencies ranging from 279 to 285 on the three literacy scales. Because the missing responses of adults who did not complete the assessment for reasons related to literacy were treated as wrong answers, the average scores of these adults were considerably lower, ranging from 114 to 124. Nearly all adults who terminated the assessment for literacy-related reasons scored in the Level 1 range (below 225). Adults who stopped for other reasons or for unstated reasons had scores between those of the other two groups, ranging from 228 to 237. These adults were not found only in the lowest literacy level, but were distributed across the five levels.

It is likely that there were some errors in classifying nonrespondents' reasons for not completing the assessment. Some adults may have given an explanation that reflected badly on their literacy skills simply because they found completing the assessment too burdensome. Perhaps they could have performed better if they had they tried harder. The assumption that such adults are unable to succeed with the literacy tasks may be too strong, and the assignment of wrong answers may underestimate their skills. Other adults may have anticipated failure in the assessment, yet concealed their lack of literacy skills by citing other reasons for not responding, or by refusing to explain their reason. The assumption that these adults are just like others in their demographic group may also be too strong, and the failure to assign wrong answers may overestimate their skills. To some extent the errors can be expected to counterbalance one another, but the available data are insufficient to assess which kind of classification error occurred more often.

Table A.1: Percentages and average proficiencies of adults on each scale, by assessment completion status

		Literacy scale		
		Prose	Document	Quantitative
Assessment completion status	CPCT	PROF (se)	PROF (se)	PROF (se)
Total	100	272 (0.6)	267 (0.7)	271 (0.7)
Completed assessment	88	285 (0.6)	279 (0.6)	284 (0.6)
Did not complete assessment for literacy-related reasons	6	124 (1.5)	116 (1.4)	114 (1.9)
Did not complete assessment for reasons unrelated to literacy	6	237 (3.0)	228 (2.8)	231 (3.6)

Notes: CPCT = column percentage; PROF = average proficiency; se = standard error.

SOURCE: U.S. Department of Education, National Center for Education Statistics, National Adult Literacy Survey, 1992.

Performance in the Lowest Literacy Level

Level 1 is somewhat different from the other literacy levels. For Levels 2 through 5, adults who can consistently perform the tasks in a given level (that is, at least 80 percent of the time) are said to perform in that level. For example, adults in Level 2 have a high probability of success on the tasks in that level, and more than an 80 percent likelihood of success on the Level 1 tasks.

Likewise, adults in Level 3 have a high probability of success on the tasks in that level, as well as on the tasks in Levels 1 and 2.

Level 1, on the other hand, includes adults with a wide range of literacy skills, including some who performed the Level 1 tasks consistently and others who did not. Individuals who do not have an 80 percent probability of success with Level 1 tasks are still grouped in Level 1. Thus, some but not all adults in this level met the relatively undemanding requirements of the Level 1 tasks. This section describes how many adults in Level 1 did not meet the demands of the tasks in this level.

The failure to perform correctly at least one of the literacy tasks can be taken as an indicator of not being able to meet the demands of tasks in Level 1. Table A.2 provides information on the size of the groups that met or did not meet the relatively undemanding requirements of the Level 1 tasks.

Most adults in the lowest literacy level on each scale performed at least one literacy task correctly. Nearly three-quarters (72 percent) of adults in Level 1 on the prose scale performed at least one task correctly, as did 83 percent of those in Level 1 on the document scale and 66 percent of those in Level 1 on the quantitative scale. The difference in performance among the scales occurs because the least difficult document task had a value of 68, while the least difficult prose task had a value of 149 and the least difficult quantitative task had a value of 191.

Table A.2: Percentages and average proficiencies on each scale of adults in Level 1

	Literacy scale					
	Prose		Document		Quantitative	
Performance	CPCT	PROF	CPCT	PROF	CPCT	PROF
Total in Level 1	100	173	100	172	100	167
At least one task correct	72	190	83	182	66	190
No tasks correct	21	113	11	94	26	110
No performance data	7	177	6	177	8	159

Notes: CPCT = column percentage; PROF = average proficiency.

SOURCE: U.S. Department of Education, National Center for Education Statistics, National Adult Literacy Survey, 1992.

A small proportion of adults in Level 1 did not perform any literacy tasks correctly. Some of these adults completed the survey, while others did not for literacy-related or other reasons. Those who did not succeed on any literacy tasks constitute 21 percent of adults in Level 1 on the prose scale, 11 percent of adults in Level 1 on the document scale, and 26 percent of adults in Level 1 on the quantitative scale. There are wide disparities in average proficiencies between those who performed at least one task correctly (182 to 190 across the scales) and those who did not (94 to 113 across the scales).

For some adults in Level 1 (6 to 8 percent) there are no literacy performance data because they did not respond to any of the literacy tasks for reasons unrelated to their literacy skills or for unknown reasons. These persons could not be described as either meeting or failing to meet the demands of the literacy tasks, so they are distinguished as a separate group. Their proficiencies were inferred from the performance of other adults with similar demographic backgrounds and fell in the middle range between the other two groups. Nearly all adults who correctly responded to at least one literacy task also completed the assessment. Still, some adults broke off the assessment after already having shown some initial success. Table A.3 divides adults in Level 1 who were successful with at least one task into two groups: those who completed the assessment (at least five literacy tasks) and those who did not.

Across the scales, from 83 to 90 percent of those in Level 1 who correctly responded to at least one task also completed the assessment. Their average scores ranged from 192 to 196. The remainder (10 to 17 percent) performed at least one task correctly before breaking off the assessment. Their average scores were much lower, ranging from 132 to 153.

Table A.3: Percentages and average proficiencies of adults in Level 1 with at least one task correct, by assessment completion status

	Literacy scale					
	Prose		Document		Quantitative	
Completion status	CPCT	PROF	CPCT	PROF	CPCT	PROF
Total in Level 1 with at least one task correct	100	190	100	182	100	190
Completed assessment	87	196	83	192	90	194
Did not complete assessment	13	153	17	132	10	153

Notes: CPCT = column percentage; PROF = average proficiency.

SOURCE: U.S. Department of Education, National Center for Education Statistics, National Adult Literacy Survey, 1992.

The population of adults who scored in Level 1 on each scale includes not only those who demonstrated success with at least some of the tasks in Level 1 — who constituted the majority — but also those who did not succeed with any of the tasks in this level. Nearly all of those in Level 1 who did not perform any literacy tasks correctly also failed to complete the assessment (86 to 98 percent), as shown in table A.4. Their average scores range from 93 to 107 across the scales. Most of these adults either did not start or broke off the assessment for literacy-related reasons, so that any literacy tasks that remained unanswered were treated as incorrect.

Table A.4: Percentages and average proficiencies of adults in Level 1 with no tasks correct, by assessment completion status

	Literacy scale					
	Prose		Document		Quantitative	
Completion status	CPCT	PROF	CPCT	PROF	CPCT	PROF
Total in Level 1 with no tasks correct	100	113	100	94	100	110
Completed assessment	14	148	2	----	14	146
Did not complete assessment	86	107	98	93	86	98

Notes: CPCT = column percentage, PROF = average proficiency.
---- indicates that the cell size is too small to provide reliable proficiency estimates.

SOURCE: U.S. Department of Education, National Center for Education Statistics, National Adult Literacy Survey, 1992.

Two to 14 percent of the adults in Level 1 who did not succeed on any of the literacy tasks did, in fact, complete the assessment. Their average scores were 148 on the prose scale and 146 on the quantitative scale; too few cases were available to estimate an average document score.

The pattern of Level 1 proficiencies associated with various combinations of missing and incorrect answers shows the consequences of including, rather than excluding, adults who did not complete the assessment for literacy-related reasons. In general, the very low scores of these adults bring down the average for any group in which they are a significant component. Omitting these persons from the assessment would have resulted in inflated estimates of the literacy skills of the adult population overall and particularly of certain subgroups.

Population Diversity within the Lowest Literacy Level

Certain populations of adults were disproportionately likely not to meet the demands of the Level 1 tasks. This section describes the characteristics of adults in Level 1 who did not meet the relatively undemanding requirements of the tasks in this level. Tables A.5P, D, and Q provide information on the demographic composition of the total adult population in this country, of adults in Level 1 on each literacy scale, and of those adults in Level 1 who did not succeed on any of the assessment tasks.

Table A.5P: Percentages of adults in selected groups, by membership in total U.S. population, in Level 1, and in Level 1 with no tasks correct

	Prose scale		
	Total U.S. population	Level 1 population	Level 1 no tasks correct
Population group	CPCT	CPCT	CPCT
Weighted sample size (in millions)	191.3	40.0	8.2
Country of birth			
Born in another country	10	25 (1.3)	55 (2.2)
Highest level of education			
0 to 8 years	10	35 (1.6)	61 (2.3)
9 to 12 years	13	27 (1.3)	17 (1.5)
HS diploma or GED	30	24 (1.4)	14 (1.5)
Race/Ethnicity			
White	76	51 (0.6)	29 (2.3)
Black	11	20 (1.0)	15 (1.4)
Hispanic	10	23 (1.4)	49 (2.1)
Asian/Pacific Islander	2	4 (3.9)	5 (0.9)
Age			
16 to 24 years	18	13 (0.8)	10 (1.2)
65 years and older	16	33 (1.5)	28 (1.8)
Disability or condition			
Any condition	12	26 (1.0)	26 (1.7)
Visual difficulty	7	19 (1.5)	20 (1.5)
Hearing difficulty	7	13 (1.6)	13 (2.0)
Learning disability	3	9 (2.1)	15 (1.4)

Notes: CPCT = column percentage; se = standard error.

SOURCE: U.S. Department of Education, National Center for Education Statistics, National Adult Literacy Survey, 1992.

Table A.5D: Percentages of adults in selected groups, by membership in total U.S. population, in Level 1, and in Level 1 with no tasks correct

	Document scale		
	Total U.S. population	Level 1 population	Level 1 no tasks correct
Population group	CPCT	CPCT	CPCT
Weighted sample size (in millions)	191.3	44.0	4.7
Country of birth			
Born in another country	10	22 (1.3)	67 (3.2)
Highest level of education			
0 to 8 years	10	33 (1.5)	65 (3.1)
9 to 12 years	13	26 (1.5)	12 (1.7)
HS diploma or GED	30	26 (1.7)	13 (2.1)
Race/Ethnicity			
White	76	54 (0.7)	21 (3.0)
Black	11	20 (0.9)	9 (1.1)
Hispanic	10	21 (1.7)	62 (3.2)
Asian/Pacific Islander	2	3 (3.2)	5 (1.6)
Age			
16 to 24 years	18	11 (0.6)	11 (1.8)
65 years and older	16	35 (1.5)	25 (2.2)
Disability or condition			
Any condition	12	26 (1.2)	22 (2.5)
Visual difficulty	7	18 (1.3)	17 (2.3)
Hearing difficulty	7	13 (2.0)	12 (2.0)
Learning disability	3	8 (2.3)	14 (1.6)

Notes: CPCT = column percentage; se = standard error.

SOURCE: U.S. Department of Education, National Center for Education Statistics, National Adult Literacy Survey, 1992.

While 10 percent of the adult population reported that they were born in another country, from 22 to 25 percent of the individuals who performed in Level 1 on the three scales and 54 to 67 percent of those in Level 1 who did not perform any tasks correctly were foreign born. Some of these individuals were undoubtedly recent immigrants with a limited command of English.

Table A.5Q: Percentages of adults in selected groups, by membership in total U.S. population, in Level 1, and in Level 1 with no tasks correct

	Quantitative scale		
	Total U.S. population	Level 1 population	Level 1 no tasks correct
Population group	CPCT	CPCT	CPCT
Weighted sample size (in millions)	191.3	42.0	10.6
Country of birth			
Born in another country	10	22 (1.2)	54 (2.0)
Highest level of education			
0 to 8 years	10	33 (1.6)	58 (2.5)
9 to 12 years	13	27 (1.5)	20 (1.5)
HS diploma or GED	30	25 (1.6)	13 (1.3)
Race/Ethnicity			
White	76	50 (0.5)	34 (2.2)
Black	11	23 (0.9)	19 (1.2)
Hispanic	10	22 (1.3)	40 (1.9)
Asian/Pacific Islander	2	3 (3.6)	5 (0.9)
Age			
16 to 24 years	18	14 (0.8)	10 (0.9)
65 years and older	16	32 (1.5)	32 (1.7)
Disability or condition			
Any condition	12	26 (1.2)	28 (1.4)
Visual difficulty	7	19 (1.4)	21 (1.4)
Hearing difficulty	7	12 (2.1)	13 (1.5)
Learning disability	3	8 (2.7)	15 (1.0)

Notes: CPCT = column percentage, se = standard error.

SOURCE: U.S. Department of Education, National Center for Education Statistics, National Adult Literacy Survey, 1992.

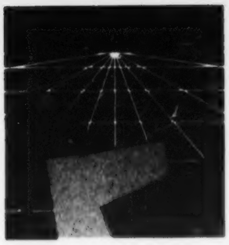
Adults who did not complete high school were also disproportionately represented at the low end of the literacy scales. While 23 percent of the adult population reported that they had not completed high school, 59 to 62 percent of adults who performed in Level 1 on the three scales and 77 to 78 percent of those in Level 1 with no tasks correct said they had not completed high school or its equivalent.

Relatively high percentages of the respondents in Level 1 were Black, Hispanic, or Asian/Pacific Islander. The largest group among those who did not perform any tasks correctly were Hispanic. Hispanics and Asian/Pacific Islanders are more likely than others to be recent immigrants with a limited command of English.

Older adults were overrepresented in the Level 1 population as well as in the population of adults who did not meet the demands of the Level 1 tasks. While 16 percent of the total U.S. population was age 65 or older, approximately one-third of the Level 1 population and 25 to 32 percent of the adults in Level 1 who performed no literacy tasks correctly were in this age group. In contrast, compared with their representation in the total U.S. population (18 percent), younger adults were underrepresented in Level 1 (11 to 14 percent) and in the subgroup of Level 1 that did not succeed on any of the literacy tasks (10 to 11 percent).

Disabilities are sometimes associated with low literacy performance. While 12 percent of the adult population reported having a physical, mental, or health condition that kept them from participating fully in work and other activities, 26 percent of adults who performed in Level 1 and 22 to 28 percent of those in Level 1 who did not succeed on any of the literacy tasks had such conditions. Further, while only 3 percent of the U.S. population reported having a learning disability, 8 to 9 percent of the adults who performed in Level 1 on the prose, document, and quantitative scales and 14 to 15 percent of those in Level 1 who did not succeed on any task had this type of disability.

These results show that adults in some population groups were disproportionately likely to perform in the lowest literacy level, and among those who performed in this level, were disproportionately likely not to succeed on any of the literacy tasks in the assessment.



APPENDIX B

Overview of Procedures Used in the National Adult Literacy Survey

This appendix provides information about the methods and procedures used in the National Adult Literacy Survey. The forthcoming technical report will provide more extensive information about procedures. In addition, more detailed information on the development of the background questionnaires and literacy tasks can be found in *Assessing Literacy.*[1]

Sampling

The National and State Adult Literacy Surveys included the following three components: a national household sample, 11 individual state household samples, and a national prison sample. The national and state household components were based on a four-stage stratified area sample with the following stages: the selection of Primary Sampling Units (PSUs) consisting of counties or groups of counties, the selection of segments consisting of census blocks or groups of blocks, the selection of households, and the selection of age-eligible individuals. One national area sample was drawn for the national component; 11 independent, state-specific area samples were drawn for the 11 states participating in the state component (California, Illinois, Indiana, Iowa, Louisiana, New Jersey, New York, Ohio, Pennsylvania, Texas, and Washington; Florida also participated in the state study, but its survey was conducted later). The sample designs used for all 12 samples were similar, except for two principal differences. In the national sample, Black and Hispanic respondents were sampled at a higher rate than the remainder of the population in order to increase their representation in the sample, whereas the state samples used no oversampling. Also, the target population for the national sample consisted of adults 16 years of age or older, whereas the target population for the state samples consisted of adults 16 to 64 years of age.

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[1] A. Campbell, I. Kirsch, and A. Kolstad (1992). *Assessing Literacy: The Framework for the National Adult Literacy Survey.* Washington, DC: Government Printing Office.

The sample designs for all 12 household samples involved four stages of selection, each at a successively finer level of geographic detail. The first stage of sampling involved the selection of PSUs, which consist of counties or groups of counties. The PSUs were stratified on the basis of region, metropolitan status, percent Black, percent Hispanic, and, whenever possible, per capita income. The national component used the WESTAT 100 PSU master sample with the Honolulu, Hawaii PSU added to the sample with certainty, to make 101 PSUs in total. The national frame of PSUs was used to construct individual state frames for the state component and a sample of eight to 12 PSUs was selected within each of the given states. All PSUs were selected with probability proportional to the PSU's 1990 population.

The second stage of sampling involved the selection of segments (within the selected PSUs) which consist of census blocks or groups of census blocks. The segments were selected with probability proportional to size where the measure of size for a segment was a function of the number of year-round housing units within the segment. The oversampling of Black and Hispanic respondents for the national component was carried out at the segment level, where segments were classified as high minority (segments with more than 25 percent Black or Hispanic population) or not high minority. The measure of size for high minority segments was defined as the number of White non-Hispanic households plus three times the number of Black or Hispanic households. High minority segments were therefore oversampled at up to three times the rate of comparable, non-highminority segments. The measure of size for nonminority segments was simply the number of year-round housing units within the segment, as was the measure of size for all segments in the state components. One in 7 of the national component segments was selected at random to be included in a "no incentive" sample. Respondents from the remaining segments in the national component received a monetary incentive for participation, as did respondents in the state component. (Respondents from the "no incentive" segments are not included in the household sample of this report.)

The third stage of sampling involved the selection of households within the selected segments. Westat field staff visited all selected segments and prepared lists of all housing units within the boundaries of each segment as determined by the 1990 census block maps. The lists were used to construct the sampling frame for households. Households were selected with equal probability within each segment, except for White non-Hispanic households in high minority segments in the national component, which were subsampled so that the sampling rates for White non-Hispanic respondents would be about the same overall.

The fourth stage of sampling involved the selection of one or two adults within each selected household. A list of age-eligible household members (16 and older for the national component, 16 to 64 for the state component) was constructed for each selected household. One person was selected at random from households with fewer than four eligible members; two persons were selected from households with four or more eligible members. The interviewers, who were instructed to list the eligible household members in descending order by age, then identified one or two household members to interview, based on computer-generated sampling messages that were attached to each questionnaire in advance.

The sample design for the prison component involved two stages of selection. The first stage of sampling involved the selection of state or federal correctional facilities with probability proportional to size, where the measure of size for a given facility was equal to the inmate population. The second stage involved the selection of inmates within each selected facility. Inmates were selected with a probability inversely proportional to their facility's inmate population (up to a maximum of 22 interviews in a facility) so that the product of the first and second stage probabilities would be constant.

Weighting

Full sample and replicate weights were calculated for each record in order to facilitate the calculation of unbiased estimates and their standard errors. The full sample and replicate weights for the household components were calculated as the product of the base weight for a record and a compositing and raking factor. Demographic variables critical to the weighting were recoded and imputed, if necessary, prior to the calculation of base weights.

The base weight was calculated as the reciprocal of the final probability of selection for a respondent, which reflected all stages of sampling. The base weight was then multiplied by a compositing factor which combined the national and state component data in an optimal manner, considering the differences in sample design, sample size, and sampling error between the two components. Twelve different compositing factors were used, one for each of the 11 participating states, and a pseudo factor (equal to one) for all national component records from outside the 11 participating states. The product of the base weight and compositing factor for a given record was the composite weight.

The composite weights were raked so that several totals calculated with the resulting full sample weights would agree with the 1990 Census totals, adjusted for undercount. The cells used for the raking were defined to the finest combination of age, education level, race, and ethnicity that the data would allow. Raking adjustment factors were calculated separately for each of the 11 states and then for the remainder of the United States. The above procedures were repeated for 60 strategically constructed subsets of the sample to create a set of replicate weights to be used for variance estimation using the jackknife method. The replication scheme was designed to produce stable estimates of standard errors for national estimates as well as for the 11 individual states.

The full sample and replicate weights for the incarcerated component were calculated as the product of the base weight for a record and a nonresponse and raking factor. The base weight was calculated as the reciprocal of the final probability of selection for a respondent, which reflected both stages of sampling. The base weights were then nonresponse adjusted to reflect both facility and inmate nonresponse. The resulting nonresponse adjusted weights were then raked to agree with independent estimates for certain subgroups of the population.

Background Questionnaires

One of the primary goals of the National Adult Literacy Survey is to relate the literacy skills of the nation's adults to a variety of demographic characteristics and explanatory variables. Accordingly, survey respondents were asked to complete background questionnaires designed to gather information on their characteristics and experiences. To ensure standardized administration, the questionnaires were read to the respondent by trained interviewers.

As recommended by the Literacy Definition Committee, the development of the background questionnaire was guided by two goals: to ensure the usefulness of the data by addressing issues of concern, and to ensure comparability with the young adult and Department of Labor (DOL) job-seeker surveys by including some of the same questions. With these goals in mind, the background questionnaire addressed the following areas:

- general and language background
- educational background and experiences
- political and social participation
- labor force participation
- employment and earnings experiences
- literacy activities and collaboration
- demographic information

Questions in the first category asked survey participants to provide information on their country of birth, their education before coming to the United States, language(s) spoken by others at home, language(s) spoken while growing up, language(s) spoken now, participation in English as a Second Language courses, and self-evaluated proficiency in English and other languages. This information makes it possible to interpret the performance results in light of the increasing racial/ethnic and cultural diversity in the United States.

The questions on educational background and experiences asked respondents to provide information on the highest grade or level of education they had completed; their reasons for not completing high school; whether or not they had completed a high school equivalency program; their educational aspirations; the types and duration of training they had received in addition to traditional schooling; the school, home, or work contexts in which they learned various literacy skills; and any physical, mental, or health conditions they have that may affect their literacy skills. Information on respondents' education is particularly important because level of education is known to be a predictor of performance on the prose, document, and quantitative literacy scales.

The questions on political and social participation asked participants about the sources from which they get information, their television viewing practices, their use of library services, and whether or not they had voted in a recent election. Because an informed citizenry is essential to the democratic process, information was collected on how adults keep abreast of current events and public affairs. Information on adults' use of library services is also important, because libraries promote reading and often provide literacy programs. These questions make it possible to explore connections between adults' activities and their demonstrated literacy proficiencies.

The questions on labor force participation asked participants to provide information on their employment status, weekly wages or salary, weeks of employment in the past year, annual earnings, and the industry or occupation in which they work(ed). These questions respond to concerns that the literacy skills of our present and future work force are inadequate to compete in the global economy or to cope with our increasingly technological society. The questions were based on labor force concepts widely used in household surveys by the national government and permit the exploration of a variety of labor market activity and experience variables.

Questions on literacy activities and collaboration covered several important areas. Some of the questions focused on the types of materials that adults read, such as newspapers, magazines, books, and brief documents, making it possible to investigate the relationship between reading practices and demonstrated literacy proficiencies. Another set of questions asked respondents about the frequency of particular reading, writing, and mathematics activities. Respondents were asked to provide information on their newspaper, magazine, and book reading practices; reading, writing, and mathematics activities engaged in for personal use and for work; and assistance received from others with particular literacy tasks.

Finally, the survey collected information on respondents' race/ethnicity, age, and gender, as well as the educational attainment of their parents, their marital status, the number of people in their family who were employed full-time and part-time, sources of income other than employment, and family and personal income from all sources. This demographic information enabled researchers to analyze the characteristics of the adult population, as well as to investigate the literacy proficiencies of major subpopulations of interest, such as racial/ethnic groups, males and females, and various age cohorts.

Literacy Assessment Booklets

The National Adult Literacy Survey measures literacy along three scales — prose, document, and quantitative — composed of literacy tasks that simulate the types of demands that adults encounter in everyday life. The literacy tasks administered in this survey included 81 new tasks as well as 85 tasks that were included in the previous young adult and job-seeker surveys. The administration of a common pool of tasks in each of the three surveys allows for valid comparisons of results across time for different populations.

The new literacy tasks developed for the survey serve to refine and extend the three existing literacy scales and provide a better balance of tasks across the three scales. The framework used to develop these tasks reflects research on the processes and strategies that respondents used to perform the literacy tasks administered in the young adult survey. In creating the new tasks, one goal was to include diverse stimulus materials and to create questions and directives that represent the broad range of skills and processes inherent in the three domains of literacy. Another goal was to create tasks that reflect the kinds of reading, writing, and computational demands that adults encounter in work, community, and home settings. Because the tasks are meant to simulate real-life literacy activities, they are open-ended — that is, individuals must produce a written or oral response, rather than simply choose the correct response from a list of options.

The new literacy tasks were developed with attention to the following elements:

- the structure of the stimulus material — for example, exposition, narrative, table, graph, map, or advertisement
- the content represented and/or the context from which the stimulus is drawn — for example, work, home, or community
- the nature of what the individual is asked to do with the material — that is, the purpose for using the material — which in turn guides the strategies needed to complete the task successfully

These factors, operating in various combinations, affect the difficulty of a task relative to others administered in the survey.

The printed and written materials selected for the survey reflect a variety of structures and formats. Most of the prose materials are expository — that is, they describe, define, or inform — since most of the prose that adults read is expository; however, narratives and poetry are included as well. The prose selections include an array of linguistic structures, ranging from texts that are highly organized both topically and visually, to those that are loosely organized. Texts of varying lengths were chosen, ranging from full-page magazine selections to short newspaper articles. All prose materials included in the survey were reproduced in their original format.

The document materials represent a wide variety of structures, including tables, charts and graphs, forms, and maps. Tables include matrix documents in which information is arrayed in rows and columns (for example, bus or airplane schedules, lists, or tables of numbers). Documents categorized as charts and graphs include pie charts, bar graphs, and line graphs. Forms are documents that must be filled in, while other structures include advertisements and coupons.

Quantitative tasks require the reader to perform arithmetic operations using numbers that are embedded in print. Since there are no materials that are unique to quantitative tasks, they were based on prose materials and documents. Most quantitative tasks were, in fact, based on documents.

Adults do not read printed or written materials in a vacuum. Rather, they read within a particular context or for a particular purpose. Accordingly, the survey materials were chosen to represent a variety of contexts and contents. Six such areas were identified: home and family, health and safety, community and citizenship, consumer economics, work, and leisure and recreation. Efforts were made to include as broad a range as possible and to select universally relevant contexts and contents to ensure that the materials would be familiar to all participants. In this way, the disadvantages for individuals with limited background knowledge were minimized.

After the materials were selected, accompanying tasks were developed. The tasks were designed to simulate the way in which people use various types of materials and to require different strategies for successful performance. For both the prose and document scales, the tasks can be organized into three major categories: locating, integrating, and generating information. In the *locating* tasks, readers were asked to match information given in a question or directive with either literal or synonymous information in the text or document. *Integrating* tasks asked the reader to incorporate two or more pieces of information from different parts of the text or document. *Generating* tasks required readers not only to process information located in different parts of the material, but also to draw on their knowledge about a subject or to make broad, text-based inferences.

Quantitative tasks required readers to perform one or more arithmetic operations (addition, subtraction, multiplication, or division) either singly or in combination. The type of operation to be performed was sometimes obvious from the wording of the question; in other tasks the readers had to infer which operation was to be performed. In some cases the numbers required to perform the operation could be easily identified; in others they were embedded in text. Some quantitative tasks asked the reader to explain how he or she would solve a problem, rather than to perform the actual calculation. The use of a simple, four-function calculator was required for some tasks.

Survey Design

No individual could be expected to respond to the entire set of 166 simulation tasks administered as part of the survey. Accordingly, the survey design gave each respondent a subset of the total pool of literacy tasks, while at the same time ensuring that each of the 166 tasks was administered to a nationally representative sample of the adult population. Literacy tasks were assigned to blocks or sections that could be completed in about 15 minutes, and these blocks were then compiled into booklets so that each block appeared in each position (first, middle, and last) and each block was paired with every other block. Thirteen blocks of simulation tasks were assembled into 26 booklets, each of which could be completed in about 45 minutes. During a personal interview, each participant was asked to complete one booklet of literacy tasks and the background questionnaire, which required approximately 20 minutes.

Training the Data Collection Staff

For the national and state samples, 24 field supervisors, 24 field editors, and 421 field interviewers were recruited and trained in January and February of 1992. The 24 supervisors were trained first at a session in Bethesda, Maryland. The seven-day program included the interviewer training. Additionally, Westat provided training specific to supervisory responsibilities, including the use of Westat's Automated Survey Control System, a computer-based system for managing the data collection effort. Finally, supervisors and editors were trained to perform an item-by-item edit for each data collection instrument received from the field interviewers.

After the training session in Bethesda, interviewers attended training sessions geographically closest to their homes, either in San Francisco (January 31- February 2) or in Dallas (February 7-9). Four training groups were formed at each of the two training sites. Each group was led by a Westat home office field manager. Within each of the four groups, the trainees were divided into "learning communities" with approximately 18 interviewers each. Each community was led by the field supervisor who would supervise the interviewers during the data collection phase.

The training program was modeled closely after Westat's general approach for training field staff. This approach uses a mix of techniques to present study material, focusing heavily on trainee participation and practice. The training program was standardized with verbatim scripts and a detailed agenda to ensure comparability in presentation across groups.

The key training topics were the data collection instruments — the household screener, the background questionnaire, and the interview guide and literacy exercise booklet. The majority of training time was devoted to instructions for administering these documents. In addition, sessions were used to present instructional material on gaining respondent cooperation, keeping records of nonresponse cases, editing completed work, and completing administrative forms. A bilingual field supervisor provided Spanish speaking interviewers with training on the Spanish translations of the screener and background questionnaires. Prior to project-specific training, new interviewers attended an additional one-half day of training on general interviewing techniques.

Administering the Data Collection Instruments

Data collection instruments included the screener, which was designed to enumerate household members and select survey respondents, the background questionnaire, and the literacy assessment booklets. Interviewers were given their first assignments and began work immediately after training. The interviewer was given a call record folder and screener for each sampled dwelling unit in his or her assignment. A computer-generated label attached to the front of each folder and screener provided the case identification number, address, and assigned exercise booklet number. Additionally, interviewers were provided with all other field materials necessary to conduct interviews and meet reporting requirements.

Case assignments were made by the field supervisors, who also mailed letters to households about one week before the interviewers planned to contact the household. When making contact, the interviewer first verified that the address was in the sample and the unit was, in fact, an occupied dwelling. If the unit did not meet the definition of a year-round housing unit or was vacant, or for some other reason the interviewer was unable to complete a screener at an assigned address, she or he documented the situation in a noninterview report form.

The interviewer introduced the study using an introduction printed on the front of the screener. As part of the introduction, the interviewer indicated that if someone from the household was selected for an interview, the respondent would be paid $20 for participating. After introducing the study, the interviewer proceeded to conduct the screening interview with any household member 16 years of age or older. If the household members spoke only a language other than Spanish or English, the interviewer could obtain the services of a translator to complete the screener interview.

The screener was used to record the names, relationships, sex, age, and race/ethnicity of all household members at the selected dwelling unit. For the national sample, household members age 16 and older were eligible for selection. For the state sample, however, household members age 16 to 64 were eligible. In households with three or fewer eligible household members, one was randomly selected for the interview. In households with four or more eligible persons, two were selected. To select respondents, interviewers first listed the names and ages (in descending age order) of all eligible household members. They then referred to a sampling table which selected one or two respondents from the household.

Once the Screener was completed and a respondent(s) selected, the interviewer proceeded to administer the background questionnaire and the assessment booklet. If the selected respondent was not available at the time the screener was conducted, the interviewer returned to administer the background questionnaire and assessment booklet, which were administered on the same visit.

The background questionnaire took approximately 20 minutes to administer and could be conducted in English or Spanish (using the Spanish printed version) only. In the introduction to the background questionnaire, the respondent was told that he or she would be given a check for $20 in appreciation of the time and effort involved in completing the interview, questionnaires, and assessment. The background questionnaire was divided into six sections and collected demographic data as well as data on literacy-related behaviors.

When the background questionnaire was completed, the interviewer administered the assessment booklet, which took approximately 45 minutes to complete. There were 26 different versions of the assessment booklet, and each version had a corresponding interview guide, which the interviewer used to facilitate the respondent's completion of tasks in the booklet.

Response Rates

Since there were three instruments — screener, background questionnaire, and assessment booklet — required for the administration of the survey, it was possible for a household or respondent to refuse to participate at the time of the administration of any one of these instruments. The response rates presented below reflect the percentage of those who had the opportunity to participate at each stage of the survey. The response rates for the national household sample are presented in table b.1.

NALS Table B.1

Response Rates for the National Adult Literacy Survey

Instrument	Response Rate
Screener	89.1%
Background Questionnaire	81.0%
Assessment Booklet	95.8%

SOURCE: U.S. Department of Education, National Center for Education Statistics, National Adult Literacy Survey, 1992.

Data Collection Quality Control

Several quality control procedures were used during data collection. These included an interviewer field edit, a complete edit of all documents by a trained field editor, validation of 10 percent of each interviewer's completed work, and field observation of both supervisors and interviewers.

At the interviewer training session, interviewers were instructed on procedures for performing a field edit of all data collection documents. The main purpose of this edit was to catch and correct or explain any errors or omissions in recording, to learn from mistakes so they were not repeated, and to remove stray marks and completely fill in bubbles on the documents that were to be optically scanned.

Additionally, a complete edit was performed on all documents by a trained field editor. An item-by-item review was performed on each document, and each error was fully documented on an edit form. The supervisor reviewed the results of the edit with the interviewer during his or her weekly telephone conference.

Validation is the quality control procedure used to verify that an interview was conducted and it took place at the correct address and according to specified procedures, or that nonresponse statuses (e.g., refusals, vacancies, language problems) were accurately reported by the interviewers. Interviewers knew that their work would be validated but did not know to what extent or which cases. A 10 percent subsample of dwelling units were selected and flagged in the supervisor's log and in the automated survey control system. The supervisors performed validation interviews by telephone if a phone number was available. Otherwise, validation was performed in person by the supervisor or by another interviewer.

Field observations of both supervisors and interviewers were performed by Westat field management staff. One purpose of the interviewer observation was to provide home office staff with an opportunity to observe effectively both performance of field procedures and respondents' reactions to the survey. Another purpose was to provide feedback to weak interviewers when there was concern about their skills and/or performance. In addition to in-person observations, interviewers were required to tape record one complete interview and assessment. The field supervisor selected the particular case in advance and listened to the tape to "observe" each interviewer.

Finally, nine of the 24 supervisors were visited by field management staff and evaluated on their editing, coding, office organization, ability to maintain up-to-date records on production data, and supervision of interviewers.

Scoring the Literacy Assessment Booklets

As the first shipments of assessment booklets were received at Educational Testing Service, copies were made of actual responses to the tasks. These sample responses were then scored by various staff, including the test developer and scoring supervisor, using either the scoring guides developed for the young adult tasks or guides prepared during the development of the new tasks. As the sample responses were scored, adjustments were made to the scoring guides for the new tasks to reflect the kinds of answers that the respondents were providing.

The sample papers comprised the training sets used to train a group of readers who would score the assessment booklets. The purposes of the training were to familiarize the readers with the scoring guides and to ensure a high level of agreement among the readers. Each task and its scoring guide were explained and sample responses representative of the score points in the guide were discussed. The readers then scored and discussed an additional 10 to 30 responses. After group training had been completed, all the readers scored all the tasks in more than one hundred booklets to give them practice in scoring actual booklets, as well as an opportunity to score more responses on a practice basis. A follow-up session was then held to discuss responses on which readers disagreed. The entire training process was completed in about four weeks.

Twenty percent of all the exercise booklets were subjected to a reader reliability check, which entailed a scoring by a second reader. To prevent the second reader from being influenced by the first reader's scores, the first reader masked the scores in every fifth booklet that he or she scored. These booklets were then passed on for a second reader to score. When the second reader had scored every item, the first reader's scores were unmasked. If there was a discrepancy between the two scores for any response, the scoring supervisor reviewed the response and discussed it with the readers involved.

The statistic used to report inter-reader reliability is the percentage of exact agreement — that is, the percentage of times the two readers agreed exactly in their scores. There was a high degree of reader reliability across all the tasks in the survey, ranging from a low of 88.1 percent to a high of 99.9 percent with an average agreement of 97 percent. For 133 out of 166 open-ended tasks, the agreement was above 95 percent.

Data Entry

The background questionnaire was designed to be read by a computerized scanning device. For most questions, field personnel filled in ovals next to the respondent's answers. Open-ended items in the background questionnaire were coded and the ovals filled in by Educational Testing Service staff before they were shipped to the scanning department. Responses on the screener were transferred to scannable documents by Educational Testing Service personnel when the check-in process was complete, and the screener documents were batched and sent to the scanning department on a regular basis. Exercise booklet scores were transferred to scannable documents by the readers who scored the items, and these were also batched and sent to the scanning department at regular intervals. The scanned data from screeners, background questionnaires, and exercise booklets were transmitted to magnetic tape, which was then sent to the Educational Testing Service computer center. As each of the different instruments were processed, the data were transferred to a database on the main computer for editing.

Editing and Quality Control

Editing included an assessment of the internal logic and consistency of the data received. For example, data were examined for nonexistent housing locations or booklets, illogical or inconsistent responses, and multiple responses. Where indicated, an error listing was generated and sent back to the processing area, where the original document was retrieved and the discrepancies were corrected. If resolution of a conflict in the data was not possible, the information was left in the form in which it was received. Wherever possible, however, conflicts were resolved. For example, in the infrequent cases in which field personnel provided more than one response to a single-response noncognitive item, specific guidelines were developed to incorporate these responses consistently and accurately. The background questionnaires were also checked to make sure that the skip patterns had been followed and all data errors were resolved. In addition, a random set of booklets was selected to provide an additional check on the accuracy of transferring information from booklets and answer sheets to the database.

Scaling

The results from the National Adult Literacy Survey are reported on three scales established as part of the 1985 Young Adult Literacy Survey: prose literacy, document literacy, and quantitative literacy. With scaling methods, the performance of a sample of examinees can be summarized on a series of subscales even when different respondents have been administered different items. Conventional scoring methods are not suited for assessments like the national survey. Statistics based on the number of correct responses, such as proportion of correct responses, are inappropriate for examinees who receive different sets of items. Moreover, item-by-item reporting ignores similarities of subgroup comparisons that are common across items. Finally, using average percent correct to estimate means of proficiencies of examinees within subpopulations does not provide any other information about the distribution of skills among the examinees.

The limitations of conventional scoring methods can be overcome by the use of item response theory (IRT) scaling. When several items require similar skills, the response patterns should have some uniformity. Such uniformity can be used to characterize both examinees and items in terms of a common scale attached to the skills, even when all examinees do not take identical sets of items. Comparisons of items and examinees can then be made in reference to a scale, rather than to percent correct. IRT scaling also allows distributions of groups of examinees to be compared.

Scaling was carried out separately for each of the three domains of literacy (prose, document, and quantitative). The NAEP reading scale, used in the young adult survey, was dropped because of its lack of relevance to the current NAEP reading scale. The scaling model used for the national survey is the three-parameter logistic (3PL) model from item response theory.[2] It is a mathematical model for estimating the probability that a particular person will respond correctly to a particular item from a single domain of items. This probability is given as a function of a parameter characterizing the proficiency of that person, and three parameters characterizing the properties of that item.

Linking the National Adult Literacy Survey Scales to the Young Adult Literacy Survey Scales

Prose, document, and quantitative literacy results for the National Adult Literacy Survey are reported on scales that were established in the Young Adult Literacy Survey. For each scale, a number of new items unique to the national survey were added to the item pool that was administered in the 1985 young adult survey. The scales for the two surveys are linked based on the items common to both — that is, items administered in the 1985 survey and readministered in the 1992 survey. Fifty-one percent of the items administered in the national survey were also included in the young adult survey. The composition of the National Adult Literacy Survey item pool is presented in table b.2.

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[2] A. Birnbaum. (1968). "Some Latent Trait Models." In F.M. Lord and M.R. Novick, *Statistical Theories of Mental Test Scores*. Reading, MA: Addison-Wesley. F.M. Lord. (1980). *Applications of Item Response Theory to Practical Testing Problems*. Hillsdale, NJ: Erlbaum.

Composition of the Item Pool for the National Adult Literacy Survey

	Number of Items		
SCALE	YALS items	New items	NALS total
Prose	14	27	41
Document	56	26	82
Quantitative	15	28	43
Total	85	81	166

SOURCE: U.S. Department of Education, National Center for Education Statistics, National Adult Literacy Survey, 1992.

A unidimensional IRT model like the three-parameter logistic model employed in this study assumes that performance on all the items in a domain can, for the most part, be accounted for by a single (unobservable) proficiency variable. Subsequent IRT linking and scaling analyses treat each scale separately, that is, a unique proficiency is assumed for each scale. As a result, the linking of corresponding scales was carried out for each pair of scales separately. The three steps used to link the scales are as follows.

1. Establish provisional IRT scales through common item parameter calibration based on a pooling of the National and Young Adult Literacy Survey items.
2. Estimate distribution of proficiencies on the provisional IRT scales using "plausible values" methodology.
3. Align the National Adult Literacy Survey scale to the Young Adult Literacy Survey scale by a linear transformation based on the commonality of proficiency distribution of the latter survey sample.

Statistical Procedures

Many of the statistical comparisons in this report were based on the t statistic. Generally, whether or not a difference is considered significant is determined by calculating a t value for the difference between a pair of means, or proportions, and comparing this t value to published tables of values at certain critical levels, called *alpha levels*. The alpha level is an a priori statement of the probability of inferring that a difference exists when, in fact, it does not.

In order to make proper inferences and interpretations from the statistics, several points must be kept in mind. First, comparisons resulting in large t statistics may appear to merit special note. This is not always the case, because the size of the t statistic depends not only on the observed differences in means or the percentages being compared, but also on the standard error of the difference. Thus, a small difference between two groups with a much smaller standard error could result in a large t statistic, but this small difference is not necessarily noteworthy. Second, when multiple statistical comparisons are made on the same data, it becomes increasingly likely that an indication of a population difference is erroneous. Even when there is no difference in the true means or proportions for the two populations, at an alpha level of .05, there is still a 5 percent chance of concluding that an observed t value representing one comparison in the sample is large enough to be statistically significant. As the number of comparisons increases, the risk of making such an error in inference also increases.

To guard against errors of inference based upon multiple comparisons, the Bonferroni procedure to correct significance tests for multiple contrasts was used. This method corrects the significance (or alpha) level for the total number of contrasts made with a particular classification variable. For each classification variable, there are $(K \bullet (K-1))/2$ possible contrasts (or nonredundant pairwise comparisons), where K is the number of categories. The Bonferroni procedure divides the alpha level for a single t test (for example, .05) by the number of possible pairwise comparisons in order to give a new alpha that is corrected for the fact that multiple contrasts are being made. The formula used to compute the t statistic is as follows:

$$t = \frac{P_1 - P_2}{\sqrt{se_1^2 + se_2^2}}$$

where P_1 and P_2 are the estimates to be compared and se_1 and se_2 are their corresponding standard errors.

Making Comparisons

The study design and scientific procedures employed in this survey permit a high degree of confidence in the resulting estimates of task difficulty and assure that participants' responses can be generalized to the populations of interest. Readers of this report should bear in mind, however, that the literacy tasks contained in the assessment and the adults invited to participate in the survey are samples drawn from their two respective universes. The results are, accordingly, subject to a measurable degree of uncertainty, which is captured in the standard errors enclosed in parentheses after many of the numbers presented in the tables herein.

In situations where there are too few respondents in a group to provide reliable information — specifically, when there are fewer than 30 respondents — no data are provided. Instead, the relevant cells in the table are denoted with dashes.

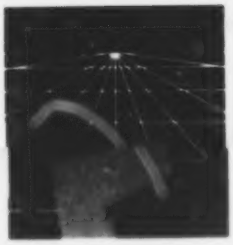
Using confidence intervals based on the standard errors provides a way to make inferences about the survey results in a manner that reflects the uncertainty inherent in any sample estimate. An average proficiency score, or a percentage, plus or minus two standard errors represents a 95 percent confidence interval for the corresponding population quantity. For example, the sample of full-time employees has a mean prose score of 288, with a standard error of .9. One can conclude with 95 percent certainty that the average prose score of all full-time employees in the nation is between 286 and 290, since 0.9 x 2 = 1.8, and 288 ± 1.8 = 286.2 to 289.8 (rounded to 286 to 290).

Where this report compares the demonstrated literacy skills of various groups, only those differences that are statistically significant are discussed or noted. Each comparison is based on a statistical test, known as the t statistic, which considers not only the magnitude of the differences between any two groups (for example, the gap in average document proficiency between high school and college graduates), but also the size of the standard errors associated with the numbers being compared and the number of comparisons being made.

The formula used to compute the t statistic is provided earlier in this appendix. Once the t statistic is known, it is necessary to determine whether this value meets the standard for statistical significance. Generally, when two groups are being compared, determinations of statistical significance are made at the .05 level, indicating that there is only a 5 percent chance that the observed difference is not, in fact, a true difference but is instead due to variability in the population estimates. When multiple comparisons are made using the same data, however, the likelihood of finding a spurious difference increases. To guard against such errors of inference, the Bonferroni procedure is used to correct significance tests for multiple comparisons. This procedure divides the alpha level for a single t test (.05) by the number of comparisons being made.

An example may be helpful. Suppose that one wanted to compare the mean prose proficiencies of full-time employees (288 with a standard error of .9) and part-time employees (284 with a standard error of 1.4). The difference in average scores between the two groups ($P_1 - P_2$) is 4, and the standard error associated with the difference ($\sqrt{(se_1^2 + se_2^2)}$) is 1.66, so the t statistic for this comparison is 2.47.

Since the labor force status variable has five response categories, the total number of comparisons that could be made using this variable is 10. Using a published table of critical values that adjusts for multiple comparisons, we find that the statistical significance "threshold" for 10 comparisons is 2.807. The actual t statistic for our comparison (2.47) is slightly below this threshold, so the observed difference in mean prose scores between full- and part-time employees is not considered statistically significant at the .05 level. In comparing the proficiencies of various groups, readers are advised to rely on statistical tests of this nature, rather than use the actual proficiency numbers alone.



APPENDIX C

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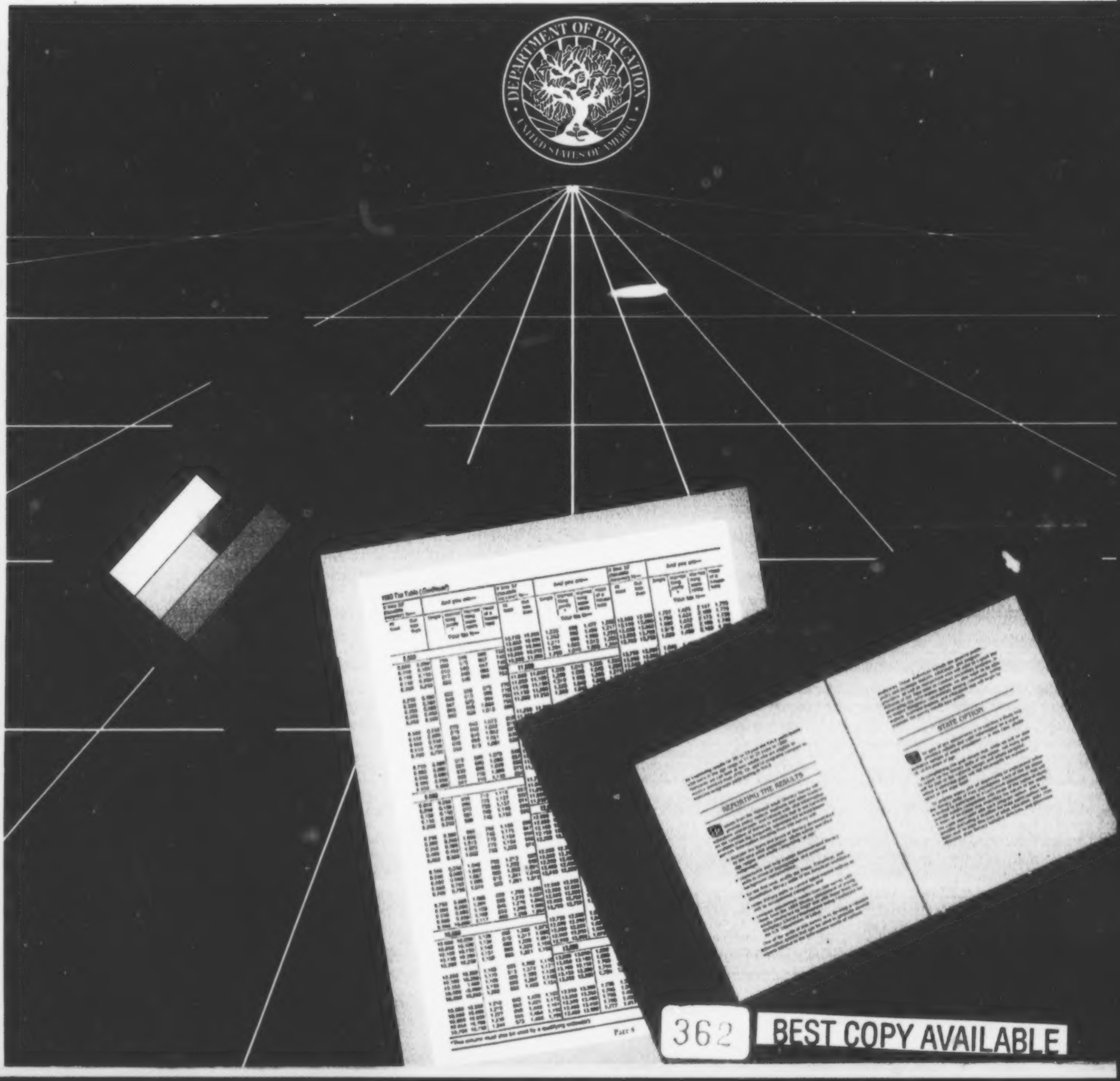

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